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OLD AGE
IN THE MODERN WORLD

REPORT OF THE
THIRD CONGRESS OF THE
INTERNATIONAL ASSOCIATION
OF GERONTOLOGY
LONDON
1954



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The Congress of the International Association of Gerontology held in London in July 1954 was organised with the financial help of the Council for International Organisations of Medical Sciences, an organisation subsidised by the World Health Organisation and UNESCO.

PREFACE

THE British Organising Committee of the Third Congress of the International Association of Gerontology decided to publish a report on the Congress and entrusted its production to a special committee: Dr C. A. Boucher, Dr O. Olbrich, Mr W. A. Sanderson, Dr J. H. Sheldon, Professor R. E. Tunbridge, and Dr Marjory Warren.

Verbatim reports of the whole Congress were available, with the exception of the proceedings of Section 4 which were conducted *in camera* at the express wish of the Sectional Committee, together with the independent reports of the chairmen and secretaries of the individual sessions and the manuscripts of the majority of the communications given at the Congress. It was at once apparent that the publication of a full verbatim report would have been impossible within the limits set by the financial responsibilities of the Committee on the one hand and a reasonable purchase price on the other. For the purposes of historical record, the verbatim report will be deposited with the Library of the Royal Society of Medicine, London, England.

A uniform scaling down, regardless of content, would have failed to do justice to those sessions, which by common consent had been of outstanding interest. In their task of selection the Committee have therefore given preference to communications containing original material, opening up new avenues of thought, or presenting authoritative reviews. Communications relating to work already published, or known to be in the press, have been referred to by title only.

The segregation of papers into chapters has been covered by the desire to aid readers interested in particular branches of the subject and is not always identical with the sessional arrangements of the Congress where other factors, such as available time, were important. The Editorial Committee are fully aware of the limitations of the report and of the impossibility of conveying to the general reader all facets of the work of the Congress. They do, however, take full responsibility for the selection of the material included in the report,

and they ask the indulgence of contributors for this action which has been forced upon them by financial limitations.

The Editorial Committee wish to express their thanks to all the speakers at the Congress for so readily agreeing to the request for the loan of their manuscripts; to Messrs J. Winder & Co. for the excellence of the verbatim report; to Mrs Humpage, Honorary Organising Secretary of the Congress, for her help and assistance; to Mr H. G. Lumby for the design of the book cover; to Miss E. M. Read for assistance in the checking of the references; to the Editor of the *Lancet* for permission to reproduce the President's Address; to Her Majesty's Stationery Office for the loan of blocks for figures on page 118; to Messrs George Allen & Unwin for permission to quote poems from Waley, "Life and Times of Po-Chü-i," 1949; to C.I.O.M.S. for their financial support; and to Messrs E. & S. Livingstone for their helpful advice and unfailing courtesy.

THE EDITORIAL COMMITTEE.

March 1955.

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...expres their thanks to all the

for

THE RIGHT HONOURABLE IAIN MACLEOD, M.P.

Minister of Health

MR PRESIDENT, PAST PRESIDENT, LADIES, AND GENTLEMEN: This is the Third Congress [illegible] from more than fo[illegible] here to-day, and I [illegible] to bid you welcome.

Although the history of your Association is a short one, I regard this as perhaps the most important of all the international medical and social Congresses that have met in London, because you seek to find a solution of what is unquestionably the most difficult social problem of the age in all civilised countries, that is, the care of the aged. This problem is becoming more urgent, largely, indeed, because of the dramatic success of your brother and sister physicians and surgeons, scientists and chemists, who have succeeded by their discoveries and work in prolonging the lives of countless millions of people who, not so long ago, would not have survived at all. There is little doubt that this increasing emphasis on the older people in our community is becoming a permanent feature of our population structure.

[illegible] is not survival, but surely it is happiness that is the true fulfilment of the task to which you have set your hand. This is not a problem for one Ministry or one Minister alone in any country. Here in England and Wales I perhaps have the primary responsibility, but many of my colleagues in the Government are concerned: for example, the Minister of Labour with employment of all people including the aged, the Minister of Housing and Local Government with suitable houses, and the Minister of National Insurance with maintaining the incomes of the old and those who fall on difficult social times.

There is not in this country a Minister for Old People, and this, I think, points to the cardinal principle of our approach. We do not [illegible] we have centuries-old tradition of a vigorous voluntary movement which supports and enriches what the State can do. There is very much that ordinary people can do in this field. There are voluntary movements that help in the hospitals, that provide and run clubs for

old people, the organisations which provide meals on wheels which take hot meals to the old people in their homes, and, more than all those things, the organisations which provide friendship for these old people.

One of the greatest difficulties of old people is the problem of loneliness. It is a problem too often left out of the ordinary calculations, and, in my view, it is a matter of the first importance. There are many organisations in this country that help to combat that loneliness, and I would refer to the work of the women in this field, and I would instance one example. In some areas of this country the Women's Institute, a voluntary organisation operating in the rural districts, have established a system of "friends," who visit and help old people who live alone. This spirit of neighbourliness makes all the difference to the happiness and contentment of the old folk.

I want to emphasise that what we are doing is team work, which to my mind is all-important. It is not perfect and does inevitably vary from area
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in Britain is wor

Mr President, this major problem of the age in this and all civilised countries could well create a feeling of despair, but I am an optimist in this field, because if one looks back and sees what wonderful discoveries have been made in science, chemistry, and in other directions
and if one thinks o
made in recent yea
we will be able to find the answer to this most serious problem. I think we should remember that although we do not look for dramatic results we should not overlook also the very substantial progress there is being made all the time in all countries. It is impressive to face this reservoir of strength of men and women who have come to this Congress from countries all over the world who are seeking a solution to these great matters. I wonder if some of you remember the lines of Arthur Hugh Clough which were quoted by the Prime Minister, Mr Churchill—as he was then—in the war years to President Roosevelt during one of the darkest periods of the war:—

> "*For while the tired waves, vainly breaking,*
> *Seem here no painful inch to gain,*
> *Far back, through creeks and inlets making,*
> *Comes silent, flooding in, the main.*"

It is that sort of strength, coming from people all over the world, which I think is going to provide the solution to this our problem.

I should like to join in with what has been said in tribute to those who have organised and made possible this Congress. I should like to say to Dr Cowdry, who has now stepped down from

the chair, how much his Presi
how grateful we are to him.
to Dr Sheldon, whose work
known to very many of you.
also to the Chairman and Organising Secretary of the British Committee, Professor Tunbridge and Mrs Humpage, who have given their all to ensure the success of this Congress.

I should like to end on what I said at the beginning: We welcome you all wherever you come from, and I want to say how much we shall value the contributions that I know you are going to make. There is nothing more important at the present time than the deliberations of this Third International Congress, which I now formally declare open.

PUBLIC ORATION

BY

Miss MARGERY FRY

J.P., Hon. LL.D., Hon. D.C.L.

BEFORE I begin what I have to say to you may I make a personal statement? I have no expert knowledge of your subject, but at least I know old age at close quarters. I am 80 myself. The joint ages of my parents added up to about 188 years. The joint ages of their five surviving children are over 417 and of these, three, with joint ages of 262 years, are older than myself and would be quite as capable, at any rate mentally and nearly as capable physically, as I am to stand here and address you to-day.

I may reassure visitors from overseas, rather sceptical about our archæological discoveries, that there is nothing faked about my skull, but I am in fact a gerontological specimen and you must take the consequences of my being such.

Old age is allowed to wander in discourse, and what I have to say to you has refused to accept a formal, logical framework, the more so since I shall not only meander from matter to matter but also because I have been amusing myself by picking odd examples from many times and places to remind you how ancient and how universally human are the questions you deal with, however modern the science you apply to them.

Needless to say, as soon as I had accepted your Secretary's invitation to speak to you I began to ask myself why on earth I had undertaken a task for which I have such scanty qualifications. Of course, I am flattered by the honour you do me. I am interested in the subject of your deliberations, but I think I was also moved by gratitude to those who devote themselves to a subject so comparatively ungrateful. You spend yourselves in the treatment of a condition—I will not say a malady—which by its very nature has but one, and that a fatal, end. I know that the care of the aged themselves is only one aspect of your work; the social implications of longer life are equally important. But it is still another side of your study which to-day I want to emphasise, your role as interpreters—interpreters not only of old age to its juniors but also of old age to itself.

Like Sir Alexander Fleming with his mould, you have found right under your noses, as it were, an under-explored field of study, and a field which is rapidly expanding. We are, rather painfully, aware of the shift towards old age of the population, but quite how marked it is becomes apparent only when we take a fairly long view. Montaigne, an author to whom I shall have to refer again, gives us a vivid idea of the position of things in the sixteenth century. People speak, he says, of a natural death, meaning thereby a death from the

failure of strength in extreme old age. We call this "natural" as though it were against nature to fall and break your neck, be drowned in a shipwreck, be overtaken by plague or pleurisy. But to die of old age is a rare lot, and so less natural than those deaths which are more common. This is, he says, the limit beyond which nature forbids us to pass; it is a rare privilege if she allows us to endure so long, an exemption which by peculiar favour she gives to one man only in two or three centuries, exempting him from the obstacles and difficulties which she casts in our way in the long course of life.

Now even allowing a margin for literary exaggeration this does suggest that four hundred years ago the ratio of old people to the whole population must have been almost negligible, even though, as one realises, in past centuries people regarded themselves as old whom we should reckon as middle-aged. Montaigne himself was under 60 when he died, yet counted himself an old man. He never, he says, had managed to learn to use spectacles and he does not think he would have known how to do it if he had lived much longer I think he would have come to it.

One result of the scarcity of veterans in the past has still, I think, its effect to-day. Until recent times very little of what has been written with regard to our last years has come from first-hand experience. The world's authors have, in the main, described youth from within, old age from without, for the world's authors, with but few exceptions, have been writing in comparative youth. Wonderful observations of old age there have been many—it is a common theme throughout the centuries—but they are as a rule the observations of younger people.

Take the description of Laertes in the *Odyssey*, scratching up weeds and feebly digging in his orchard, terribly shabby (a strong temptation this, in our later years, to "let oneself go") yet anxiously wearing his gaiters and gloves against the thorns, dependent on his old housekeeper to smarten him up when his son Ulysses reappears, as it were, from the dead. He is felt as well as seen, but felt with the pity of the young for the old rather than from the intimate [illegible]

where Ulysses describes to Agamemnon and Nestor how Patroclus amuses Achilles by "taking them off":

> 'Tis Nestor right. Now play him me, Patroclus,
> Arming to answer in a night alarm.
> And then, forsooth, the faint defects of age
> Must be the scene of mirth; to cough and spit,
> And with a palsy, fumbling on his gorget,
> Shake in and out the rivet.

Here Shakespeare shows himself bitterly aware, though he himself did not pass his fiftieth year, of the possible cruelty of youth to age. Yet even he seems hardly to enter into the very being of his old characters as he does in his younger ones. I admit that his exquisite sonnet:

> That time of year thou mayst in me behold
> When yellow leaves, or none, or few, do hang
> Upon those boughs which shake against the cold,
> Bare ruin'd choirs, where late the sweet birds sang.

a *tour de force* indeed from the pen of a man in his thirties, must perhaps be counted an exception.

Even "King Lear" is not lived from within, quite as "Hamlet" or "Macbeth" are, but Lear, the old man with the temperament of a spoilt child, immature even in his decadence, rotten before he is ripe, is tremendously an individual. He is a complete exception to

Montaigne, who was in his own estimation and in his physical condition an old man for some years before his death, and one of the Chinese poets, Po Chü-i, living in the ninth century and made known to us through the translations of Arthur Waley, who seems to me to have added a third dimension to our literature. This poet again and again startles one by the expression of a common human

respectability who is an accomplished murderess!

It would be an interesting study to follow up the changed treatment of aged characters in the drama and fiction of the last hundred years. But even admitting a greater search for personal traits, I bel

of

fall

no one really likes to be regarded as only one of a set. Neither dons nor dustmen wish to be assumed to be purely typical of their profession or occupation. To the administrator an individual may be just "that old woman, I think her name is Jones," but to herself she is *the* Katie Jones who won a prize for scripture and had the smallest waist in her class—with a thousand other distinctive features—who just happens to be old.

The specific quality seen from outside is a mere accident felt from within, no more a personal characteristic than an illness might be; in fact I believe to many old people their age hardly seems to belong to them at all. This may seem far-fetched, but I have checked it in talking to a good many of my contemporaries, and I think it has a real bearing on the interpretation of one generation to another, which I hope you regard as one of your main functions.

Each of us carries through life a self-portrait, a sort of inner picture of what we think ourselves to be. This is of great importance. A young criminal the other day, describing his first really grave offence, said, " Up till then I'd always reckoned myself a decent sort of chap "; the loss of that idea of himself meant that one of his main defences had gone.

I believe that much more attention should be paid to this process, in childhood and youth, of self-delineation. We emphasise and alter our portrait as life goes on, but we rarely, if ever, quite erase its first outlines. Now in dealing with children grown-up people constantly insist on the fact of their immaturity. A hymn of my own nursery days, which I particularly loathed, began, " We are but little children weak "; how much more wholesome to have sung, " We shall be men and women strong " ! They teach you that you are a little boy or a little girl and your name is so-and-so, and you are a child—and that childishness is the one thing that is constantly rubbed in upon you in the most formative years of your life.

Intellectually you alter your opinion of yourself as adolescence, maturity, and old age follow each other, but the knowledge " I am middle-aged, I am elderly, I am old " has to be recalled into consciousness again and again, to correct a shade of emotion, a mere [illegible] once described to me as always haunting him before a journey: " the babe-in-the-wood " feeling, he called it.

All this may be merely fanciful, but I have had enough corroboration of this ridiculous trait of old age to think that far from being the first to feel it, I am only the first shamelessly to confess it.

Dreams testify to it; the stages of waking from a return to youth follow a crescendo of surprise, " But I'm too old for that, I'm 40—no, I'm 80." Listen to our Chinese poet:

[illegible]

In the day my feet are palsied and tottering:
In the night my steps go striding over the hills.

I think this common habit of dreaming of our youth does testify to the fact that we do not feel old age belongs to us. We certainly do not feel that it belongs to us in anything like the way in which outside people classify us by it. Even if the difference between old people's ideas of themselves and the classification which regards their "ancientry" (to use an obsolete word) as the one important thing about them is not exaggerated in the way I have suggested, it is serious enough in itself.

[illegible] ficulties of planning for the care of [illegible] their personalities whilst grouping [illegible] a life-long democratic intellectual person condemned to a perpetual conversation about the minor doings of the fashionable and great, and perhaps a few of the doings of the cat or dog thrown in, may counterbalance much thoughtful provision for physical comfort. It is more important, where groups are to be formed, to consider tastes than income.

As the limits of self-determination grow narrower, the ageing person clings more anxiously to what remains. Young people who have outgrown a stormy childhood will tell you that the rock on which their good behaviour came to shipwreck was constantly the irritation at having decisions about themselves made over their heads. To the old, too, choice is a precious prerogative.

In the world of prison, where every detail is dictated by discipline, the earning of even a few pence, giving a minute option between cigarettes and sweets, is found to bring relief to tension. And so the old man who can no longer decide between Blackpool and Bournemouth, or between Switzerland and [illegible]

It is this sensitive claim to retain one's personality even when physical self-determination is limited which makes it so essential, in homes for old people, to allow for single rooms—even the smallest slip of a room—where a few of those possessions which are, as it were, almost an extension of themselves, can be housed, and where they can fully be themselves. In a sense our intimate possessions are a part of ourselves. For the old our false teeth and spectacles are very nearly parts of our body, and things which we constantly use and handle are impregnated with our personality. This is specially true of those whose possessions are few. To take them away from an old person is to diminish his very being. He must have somewhere, as we say, "to himself."

By many people, who have not been over particular in their way of life, a prison with its separate cells is openly admitted to be preferable to an institution with public wards.

I have spoken of the need for those who make a study of the latter end of life to re-interpret with insistence the old to their successors. There is no one point upon which I feel stress needs to

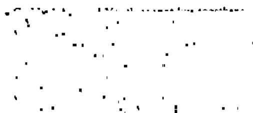
be more constantly laid than this, that the external stigmata of old *age must not be allowed to obscure the lasting divergencies of* character; individuality must be respected.

But the help which may be given by interpretation does not end there. To each of us, as we reach the natural limit of our strength, a series of surprises presents itself. It is, I think, helpful when people recognise these, even perhaps discuss them with us.

The surprises which most people have to confront on reaching old age are of two kinds: " So what we all said is true, but I never quite believed it could happen to me"—this of the effects of age visible from without; the slowness, forgetfulness, feeble knees which will not kneel, loss of words, physical defects like failing sight or dimmer hearing, sleepiness when you should wake and wakefulness when you should sleep. Such things are of those we knew, but knew externally.

We foreknew, of course, like everyone else, that those who live to be old must suffer these effects of age, but we could not (to coin a much needed word) forefeel them. " On the face of the bright mirror, I wonder whence has come this hoar frost of autumn. Ah ! my long, long white hair," writes another Chinese poet. But white hairs begin early; perhaps the first real conviction of age comes when on some hot day the hands upon your lap, ribbed with outstanding veins, seem to belong to your father or mother. Then you suddenly *say to yourself,* " Yes, *one does grow old.*"

Beyond the physical characteristics there are others, of which we have been well forewarned by the unsparing frankness of youth.



Those are some of the things we have been taught that the young do not like in the old, and we have disliked in our own turn. There are plenty of other unamiable qualities on which novelists and dramatists have insisted—testiness, avarice, dominance, insufferable boringness, and an arid censoriousness, none of which perhaps we

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apprised that they are to be expected. However, there are other internal marks of decadence which we are less prepared for. Who, for instance, has told us beforehand of the intermittency of age ?

At 20 there may be moments of illness or fatigue when you feel like 80; at 80 there are moments of vigour when you feel, at least, like 60. This intermittency is hard to explain to younger people. It seems perverse to be so fit for anything one day and so otiose the next. The old themselves are puzzled by the suddenness of change; even in one day the variations of vigour show an April inconstancy. This constant seesaw in the energy of ageing people is just one of the matters upon which your interpretation is likely always to be needed. It leads to behaviour which may well strike younger people as unreasonable and rather selfish. But if this intermittence is exasperating to younger generations it is rather puzzling to those who experience it.

It is, I suppose, a usual pattern of gradually fading powers. I do not think it is matched by anything so striking in their acquisition, though close observation does, I believe, show occasional retardations in the development of children. It is like an inverted version of the [illegible] that his loss is just temporary and can still be retrieved. But the self-deception is half-hearted, and it is sometimes difficult for old people to do as much of the climbing up as they might, because of the ever-present knowledge of the inevitable descent to follow. But after all if some capacity can be recaptured even for a few months, it is a temporary easing of a situation difficult alike for the patient and for those around him.

The doctors (and they exist) who are ever ready with "What can you expect at your age?" throw away some useful odds and ends of human life. But so tetchy and exacting are the old that the encouragement must be kept within the bounds of moderation; to try to persuade us that our downward slope is but an uneven level is only to add the assumption of senility to debility. Cicero wrote a rather pretentious and horrid little book in which he tries to persuade one that there is nothing to mind about old age. It seems to me calculated simply to annoy those it is meant to console.

The ebb and flow of strength must be learned and accepted by those who suffer it, but it has also to be constantly remembered by those who are making plans for using elderly activities to useful purpose.

One dreams of a workshop where no conveyor belt sets the remorseless pace, but where individual skill, even handicapped by some infirmities, may still give people the satisfaction of useful performance, at their own speed and times. For the sense of uselessness weighs heavily on many old people, particularly on those who have put themselves eagerly into their work, and above all, those whose work has been largely in helping others, such as mothers of families. It may almost be described as the penalty for a life well spent.

This frustration of anciency is not new. In one of the plays of Æschylus the old Greeks lament as the younger men depart for Troy:

> "As for us, rejected for this expedition because of the weakness of our despised limbs, we stay in our homes, our strength like that of children, bent over our sticks."

In Boccaccio there is a peculiarly painful description of what men think of old women: "They are good for nothing but counting the pans in the kitchen, and telling tales to the cat." I have not a doubt that the old lady who counts pans in the kitchen at least is very sure that if she were not there to count them the servant girl would make away with them, so she may feel a little useful.

This aspect is not easy to forget to-day. Each time we open a newspaper we find our generation described as a "problem." That it is one we heartily agree, but problem is not a nice word. The little villains who used to be described as bad boys and girls are now "problem children"; the households which once were the "undeserving poor" are now "problem families." No one longs [illegible]

that there are more ancients to moderns in the population to-day, but our way of living too often separates them from their natural usefulness. Where family groups hold together the grandmother of to-day, especially in middle-class families, is harder worked and more needed than ever before. Indeed we almost want a society for their protection. But the mobility of employment and the inadequacy of housing exacerbate in many modern countries the trouble caused by the tenacity of life in the old, and the skill of modern medicine.

Perhaps more might still be done to teach and utilise home handicrafts for people who are past regular work. If the materials were found, in many cases it would not be needful to pay for the work done provided the products were used to help others. I have wondered whether schools in under-developed countries might not receive help from such work. The pleasure of giving, even if it is only giving time to help those in greater need, is one which age does not stale. At a time when people must learn to receive rather than to give, it would be well to restore to them some of the satisfactions of generosity.

But after all the greatest usefulness of many old people is in a heart kept young. For children, and for more adolescents than is [illegible]

cottages for children in England the retired members of the staff live close at hand and still share in the activities of the place. Discretion is needed here. Old people are wanted sometimes, but not always. Possessiveness is fatal. "*Decrepitude is a solitary* quality," [illegible] "let me shrowd and shrugge myself into my shell [illegible] without taking hold of them." [illegible] learning, neither to withdraw nor [illegible] you experts may help by interpreting old age [illegible].

The kindness, the thoughtfulness of younger people—even of casual strangers in the street—for their elders is one of the pleasant surprises of the 70's.

I have spoken of the pleasures of old age, and it would be ungrateful to deny that there are many which some, if not all, old people enjoy. Those who have learnt to live (on however humble a scale) amongst the things of the mind can follow them more peacefully when instinct and ambition and competition are less disturbing and when leisure is compulsory.

"I would fain grow old learning many things," Solon is reported to have said. Plato suggests that old men should find a teacher, in spite of the risk of being laughed at for going back to school. In fact to keep the mind open to new thoughts, new skills, and new knowledge is the surest way of prolonging its youth. It is delightful to hear in some of our settlements of classes where old people learn for the first time the pleasure of self-expression in drawing and painting.

But it is another of the revelations of coming age that its leisure shows a queer paradox in the nature of time. When we know that our years are few we want to live them fully, to make up for the waste of neglected experience. But time plays us a dirty trick. With our retarded metabolism the days and weeks seem to race by, and even the number of hours in the day which we have the energy to use profitably grow fewer. Yet though time on a large scale is so short, from hour to hour the minutes seem to drag. Sometimes even the best-loved occupations fail.

> I have got wine, but am not well enough to drink;
> I have got poems, but am too weak to chant them.
> My head is giddy, I have had to give up fishing;
> My hand is stiff, I have stopped playing my lute.

says our Chinese poet. Let us admit that at such times old age owes a debt of gratitude to the "pastimes," in the literal sense, which help us through tired or aching or lazy hours.

We hear of the old men of Greece sitting round the fountain throwing dice. Montaigne urges that the young men may keep "their armour, their horses, their lances, their pole-axes, their tennis, their swimming and their running, and of their many games let them put over to us old men the game-boards and the cards." How many old people to-day find in their bridge, their

crosswords, or their patience almost more satisfaction than they care to own?

Loneliness is one of the saddest afflictions of age, and there are all too many who suffer it, but for those who are blessed with it the supreme pleasure of age is friendship. Young friends keep us in touch with the future, but with contemporaries comes a fuller freedom: there is no other happiness better than this. The present has its peculiar forms of interest for those who have together known the past: for them the future has a commonly limited duration. Old people together can, if they are so minded, discuss the approach of death without rousing the awkwardness which is apt to surround the subject between different generations. And though Spinoza tells us that the wise man thinks of nothing less than of death, there is also a wisdom in sharing the thoughts and feelings, and even the surprise, which its nearer approach inevitably brings.

Perhaps the power of friendship as opposed to the more passionate affections of youth is one of the faculties which actually increase in old age. In some people, too, the appreciation of beauty, whether in Nature or in the Arts, seems to be sharpened by the sense that it is not theirs for long.

Again listen to the Chinese poet Po Chü-i whom I have already named as a great interpreter of the later years.

People wonder why it is that so persistently
I wander round and round the fountain and pause beside the rocks.
The reason is, I know that soon I shall be too deaf to hear
The sound of the fountain, too dim of sight to see the shape of the rocks.

Ah! here I come to the real sting of declining years, that sight and hearing, movement and even mind itself may depart before death comes. Moreover, for those who escape such deprivation the dread of it too often lies like a shadow over years that would otherwise be happy. Even you who specialise in the needs of the old can do little to help here, though your sympathy can lighten the burden. Yet one thing can be and should be done. Poverty, painful at all times, is bitter indeed when it magnifies the troubles of old age. Here our communities help, but not enough. May I hope that you may perhaps use the prestige of your knowledge and of your influence to urge upon the younger populations the need for preventing this unnecessary suffering of the people who, after all, were their forerunners and to whom the world seemed to belong in former times as much as it seems to belong to the younger generation now.

I have finished my rambling talk, for here we come to the inevitable end which each must face for himself, whether in the bright light of faith or the dimmer uncertainty of reason. I will say goodbye in the words of the two writers I have so freely quoted.

First, the Frenchman of 350 years ago:

> I would have a man to be doing, and to prolong his lives offices as much as lieth in him, and let death seize upon me whilst I am setting my cabages, careless of her dart, but more of my unperfect garden.

And now the Chinese of just 1100 years ago:

> They have put my bed beside the unpainted screen;
> [illegible]

THE SOCIAL PHILOSOPHY OF OLD AGE

PRESIDENTIAL ADDRESS BY

J. H. SHELDON, M.D.(LOND.), F.R.C.P.

Senior Physician to the Royal Hospital, Wolverhampton.

(Reprinted from the *Lancet*, 1954, vol. ii, p. 151, by kind permission of the Editor.)

between the workers concerned. The general stimulus and fructification of ideas which form the underlying justification for our congress depend at least as much on its unique opportunities for these contacts as on the set papers and discussions, and it is the earnest hope of all those who have been responsible for its organisation that in this respect it will prove a happy and successful occasion.

For gerontology there is one further abundant justification for an international congress. The basic problems of old age are doubtless common to many of the countries represented here to-day, but their social settings necessarily vary from one to another and each may therefore learn much from the other's experience. If in this address I seem to lay undue emphasis on the British scene, I hope it will be understood at once that this in no way reflects an insularity of interest, but simply a desire to aid our visitors from overseas in an understanding of the situation as it is developing in these islands.

that one whole section of our congress is devoted to the social aspects of ageing, for in many countries old age is likely to become the dominant social problem over the next twenty years.

In the second place, by the time the stage of an international congress is reached, other subjects have usually passed through earlier phases of growth into one of some maturity; whereas, apart from the work of a few individual pioneers, our subject may be said to have lain dormant until only a few years ago when the difficulties associated with old age came suddenly into focus. They then made a simultaneous impact on a number of different interests—administrators, economists, social workers, doctors, and so on—and at the same time came the realisation that we were facing a problem destined to grow on a frightening scale. Each of these interests is inevitably concerned with particular aspects rather than the total position, and

it is the very urgency of many of their separate problems in their own right which now constitutes a major difficulty in itself—that of seeing the wood for the trees.

At the meeting of the British Association in Belfast in 1952

the more does it reflect the speed of growth of a problem that is clearly destined to involve our whole social structure—one, moreover, that, while demanding interim and separate measures, is yet at the same time steadily developing towards a state of affairs that in the end may well defy all hopes of piecemeal solutions. It is already urgent to anticipate this situation by trying to envisage the future as a whole, and it is to that aspect of gerontology that I shall devote this address.

The Ageing Population

We must begin our review of the future by looking at the changes in population structure which constitute the basic problem and in general terms are common to all western democracies.

The main features are too well known to need elaboration. For many years the old have been steadily increasing both in absolute numbers and relatively to the whole population, and this in turn has been due to the simultaneous operation of two distinct factors—the decline in birth-rates from, say, 1870 onwards which has caused the classical bulge in the population pyramid, and the steady decline in mortality rates which by lessening the normal processes of denudation allows an increasing number of survivors from the earlier age-periods to reach the ranks of old age. It seems desirable to mention these facts in view of a popular belief that the success of modern therapeutics in dealing with bacterial infection has itself caused the whole problem by a process picturesquely described as "medicated survival." Though partly true this is, of course, an exaggeration, for the great increases in expectation of life characteristic of the modern world apply to all ages, and the old have the least share in them.

All this is easy enough; our difficulties begin when on the basis of the known facts we try to forecast the future—an exercise of the imagination which is essential since the tide is on the flood, and any search for a general social philosophy of old age must take account of the possible levels that may be reached by the spring tide that for this country is predicted to arrive in about twenty years' time. Since all those who will be old then are alive now, the only factor affecting their future numbers is the mortality rate in the intervening period. On the assumption that this remains unchanged, the Royal Commission on Population estimated for Great Britain in 1977 an increase of 46 per cent. over the 1947 figures, the old—*i.e.*, men and women of 65 years and over—increasing from 5 million to 7·3 million; but with a continuance of previous trends in mortality

rate there would be 8·2 million old people, an increase of 60 per cent. These figures demonstrate not merely the uncertainties of forecasting, but also the actual seriousness of the impending situation, conditioned as it is by the crucial fact that there will be no parallel

antibiotic treatment is only of recent development and availability, and the general effect is increasingly to leave trauma, neoplasm, and the degenerative vascular states as the only important killing agents in old age, thus often lengthening the final illness. If research on the nature of the ageing process itself, now under way in many places and engaging the increasing interest of the world of science, were to bring any of these under control, our forecasts as to future numbers could be decisively out of focus.

Two Dangers

It is well to consider the further danger points that could arise in such a situation; and from our point of view as gerontologists ... be a ... rac- ... 75. ... s a ... ntial donors, whereas after it they tend to become debtors to the common effort. An increase in the proportion reaching extreme old age would inevitably cast a disproportionate burden on the health, the nursing, and the domestic resources of the community. If there should be such an increase, we may accept it as an interesting—and relevant—fact that the extreme periods of old age will be composed *even more predominantly of women than they are now, for all the* available data agree to support such a forecast.

The second danger concerns what may be termed "the average duration of final incapacity"—the ultimate period of life during which an individual may require total carriage by the younger members of the community. It is unfortunate that we have no quantitative information on the matter, for it is a possible variable of quite fundamental importance. It may, of course, be anything in an individual case from a few minutes up to fifteen or even twenty years. It will be difficult enough to cope in twenty years' time with a 50 per cent. increase in old people whose average duration of incapacity is the same as now; it would probably be impossible to deal with a situation in which this increase in total *numbers was accompanied by an increased duration of incapacity.* Yet this state of affairs, which really would merit the term "medicated survival" could be one of the eventualities awaiting us. The replacement of acute infections by slower terminal processes suggests that this may actually be happening now, and it is here that

research on the ageing process will have such profound practical as well as intellectual importance if the various degenerative disorders can thereby be brought under control. Our hope must be that the growth in numbers will be accompanied by an increase in general stamina; but we can only await the answer with some anxiety.

Maintaining Vigour

How are we to meet this impending challenge to our social stability? Clearly the first requirement is so to maintain the general vigour of the old that their capacity to contribute to the common effort is retained for as long as possible.

In this matter it is essential to keep a sense of proportion, remembering that those aspects of the therapeutic art which happen to

Service in this country leads me to say without hesitation that the provision of suitable spectacles is far and away the most important single thing that can be done to maintain the useful activity of old people, and I cannot refrain from paying a tribute to this immense benefit which our National Health Service immediately conferred on our ageing population. More than 90 per cent. of old people

doubt of the loss of capacity so caused, and the subsequent demand for spectacles substantiated the reality of the need. Alleviation by hearing aids of the decline in auditory acuity that so often accompanies ageing probably comes next to spectacles in importance. The argument for the provision of these aids to perception becomes all the stronger when one remembers that cerebral mechanisms in old age may require a greater sensory input than in youth, and that it is just in age that the special peripheral receptors themselves become so liable to structural defects.

A further important means of sustaining the vigour of the old lies in attention to their feet. One of the most common yet infuriating sights met with in old people at home is the woman whose physical activity is severely limited by painful deformity of the feet. It is infuriating because of the general tolerance of what is, in fact, a deplorable state of affairs leading, in sum, to a great loss of general efficiency. More important even than relief for existing deformities is their prevention in the future by inquiry into and control over the causative factors that may be operative in earlier life. It is good to know that this is now engaging active interest, for, to my mind, this presents a major challenge to preventive medicine. A country whose old people possess satisfactory sight and hearing, and can walk on sound feet, will have an old-age population able to contribute immensely more to the common weal than would otherwise be the case.

I cannot leave this aspect of the general problem without stressing the important role to be played by the hospitals; for there are two developments in hospital outlook of the greatest promise for the future. All honour to those pioneers who have demonstrated that, by modern methods of treatment and rehabilitation carried out in an atmosphere of hope, many of the physical disasters of advancing age, previously regarded as hopeless, can now be so far relieved as to allow the discharge from hospital of patients once more able to give some account of themselves. The other advance stems from the realisation that theories of single pathology and single ætiology rarely apply in old age, and that one dominant ætiology in the infirmities of old people is apt to lie in their domestic life. To be fully effective, hospital treatment needs to take account of the domestic environment from which the patient came and to which it is to be hoped he will return, and the recent development of links between hospital and domiciliary services is of great importance. There is need everywhere for more centres devoted to active discipleship of both these points of view.

Finally, let it never be forgotten that the key to physical vigour in so many old people lies in their state of mind and that nothing more surely saps the physical strength of old people than a complete loss of interest in life. Some of them are liable to a state of mind which approximates to that of the old mediæval sin of accidie; and it behoves us to pay regard to those factors in the environment which can help to precipitate this peculiar mixture of sadness and apathy. Of these, of course, by far the most tragic and by far the most important is loneliness.

Employment

We must now leave the old people and pass to the problems concerned in their relations with the group of working age, from 15 to 64, who are ultimately concerned in their maintenance. Finance

ployment and of social care, which respectively are characteristic of each of the two periods of old age lying on either side of the early 70's. The essential feature of the first period is that so many are not only still capable of an active contribution to the common effort but so frequently dislike being labelled as old. In Great Britain women attain official old age at 60 and men at 65, so that there is a definite gap between the times of onset of statutory and natural old age. It is during this interval, which may be anything from five to fifteen years, that so many could, if they wished and if facilities existed, continue to provide active service to the community; and it is clear that no ordinary community can face the future with equanimity if everybody on the attainment of a certain

fixed age enters what has been called " a functionless interregnum " lasting till death during which they are nevertheless subsidised to draw on the common level of production. Such a state of affairs will clearly stretch the limits of practicability when a working-age population of the same size has to support an old-age group half as large again as now.

The problem is of such importance that this Congress has devoted a special session to its consideration. So many disciplines are involved—administrative, financial, industrial, and others—that we must of necessity limit our discussion to matters on which we may fairly be expected to have opinions from the point of view of gerontology. The first two are concerned with the creation of traditions and conditions which will make it possible for anyone to continue at work as long as he is both willing and able.

Let us deal with traditions first. No one wishes to force a man or woman who has reached retiring age to continue at work against their will, but as against rigidity of custom one does desire to substitute a retirement policy whose flexibility will match individual wishes and individual variations in the ageing process. This century has witnessed the opposite process, for it has been notable for the steady growth in the tradition of retirement as the inevitable and natural corollary to the arrival of a certain birthday. Indeed the compulsory retirement of so many men at 65 has led many to feel that this figure possesses an almost mystical sanctity—that it marks a nodal point in the rhythm of life which of itself justifies a cessation from previous activities. Not only can we affirm with certainty but we must do our best to make it widely known that this is not the case. It is still true in general that " a man is as old as he feels " and in particular that the average man of 65 still has some years of activity in front of him unembarrassed by the infirmities of old age. We may also remember that for many men who derive emotional satisfaction from the whole context of their work and who are without alternative interests, the continuance in the rhythm and routine of life to which they are accustomed may perhaps help to sustain their vitality, while a sudden severance has at any rate been seen to be followed by the opposite effect.

In the second place, if the continued employment of the elderly *becomes general, technical problems will arise for whose solution* we, as scientists and doctors, carry a special responsibility. These are quite apart from the administrative and personal difficulties, such as that continuance in useful service cannot necessarily be taken as synonymous with retention of the highest levels of responsibility that have been previously reached. Our problems concern particularly the types of occupation suitable for, or harmful to, older people, and the selection of suitable alternatives, solutions to which demand a knowledge of working conditions, skill, and capacity for learning in relation to age which can only be obtained by fundamental inquiry and field studies in industry itself. In this country we are proud of the approach already developed at the Nuffield

Research Unit into Problems of Ageing, at Cambridge, under the direction of Sir Frederic Bartlett. We shall also have direct responsibilities for the health of the older workers, and the prevention of accidents, especially in relation to those aspects of the ageing process which could lead to special risks—such as the common declines in postural stability and visual acuity. We are, in fact, only at the beginning of a whole constellation of problems which lie within our sphere of work.

The third matter links the fields of employment and domestic life. The employment of women, and particularly married women, in relation to the maintenance of family life and traditions opens up big questions. Here we are concerned only with those that touch the problems of old age, of which the most important is the effect of such employment on the availability of domestic help for old people and the relative importance of the two when they happen—as they so often do—to be in conflict. The time is coming when the domestic and nursing care of the larger numbers of old people of the future will rise to the scale of a major industry with big demands on the available woman-power; and unless much of this is carried in private domestic life we shall be in serious straits. Here I am only anxious to stress the fact that in my view there is a problem, and that the growing employment of women and the availability of domestic help for old people have many points of contact if perhaps not always of compatibility.

Public or Private Care

There can be little doubt that the challenge of old age which is destined to become dominant is that of its social care, and it is in this matter above all others that we need to think out a coherent philosophy. Here we are mainly concerned with the second period of old age—that after the early 70's; and the problem is that of the maintenance of old people who require support from the community which may be anything from slight to total and from temporary to permanent. Attempts by precise terminology to characterise separate varieties of need within this group are, from our immediate point of view, irrelevant, for we are viewing the total stress laid on the community as a whole, without regard to the particular method by which it may be met. It is impossible here to enumerate the various official and voluntary activities which are concerned in the welfare of the aged, but the hospital services, the many experiments in hostels and housing, and the numerous and diverse welfare activities directed to the home all testify to the general vigour of thought and experimentation that is going on. The very extent of the effort already put forth is, however, evidence of something further—the crisis that would ensue were there to be any rapid decline in the sense of family responsibility; and that, I have no doubt, is true of other countries.

In 1946, 2 per cent. of the old people in Great Britain were accommodated in public institutions; and, allowing for those in special homes and hostels, it is probable that at least 95 per cent. were at home. Since that date the amount of special accommodation has increased considerably, but so also have the actual numbers of the old, and the assumption that 90 per cent. are still looked after at home would appear to be well within the truth. In 1946 nine-tenths of their domestic care was provided by the old people themselves and by their families and friends, and, since on this basis some 80 per cent. of the total effort is carried in private domestic life, there is justification for the statement that any substantial transfer to the community could have serious results.

In attempting to envisage the future domestic situation we are conditioned by two fixed facts:—

1. There are no alternatives to the two partners—private domestic life on the one hand and the services provided by the community on the other. Between them they have to carry the total domestic burden of old age, including that of sickness.
2. A fixed population of working age will have to support a much larger number of old people, with the added possibility that there may be a larger proportion reaching the extremes of old age.

Each partner inevitably faces a bigger task, and our ability to meet this situation will demand a social philosophy which takes them both into full account. This has hardly been so in the past, for the role of the family has been very largely taken for granted, in contrast to the active thought devoted to the direct means of relief; and in relation to old age the family is only now beginning to take its rightful place at the very core of our thinking.

It is obvious that the preservation of their independence by the old people themselves will steadily increase in importance. During the first period of old age they provide some 60 per cent. of their own care, and although this inevitably diminishes as age advances, their contribution is still significant even in the 80's. This is evidence of two facts we all know—their general vigour under natural surroundings and their craving to maintain independence up to and even beyond the last possible moment. To sustain this natural desire by various forms of domestic aid will do much for their happiness, and by its relief to the demands on permanent accommodation, the provision of such help as will enable as many old people as possible to live their full life span at home seems to me to be of the first importance. It is here that the many and varied domiciliary services provided by the local authorities and the voluntary organisations in this country assume a great and growing importance. The desire to retain independence should also remind *us that it is grossly unfair to regard the old merely as a population* group presenting us with a problem; for not only do they in the

main support their own domestic life up to the very extremes of their physical capacity, but many of them carry severe additional [illegible]

[illegible] in this respect.

The Isolates

It is a practical convenience to divide the old into two further groups—those who are socially isolated and those who live in association with others, whether in the same house or not. The isolates, as we may call them, consist mainly of the single and the widowed old people who literally live alone without neighbours, friends, children, or other relatives in regular contact. Attached to this group are the semi-isolates—those whose association with others does not extend to the care of illness, and the old married couples with no external contacts who can just manage to support each other in a state of mutual infirmity. The isolates form the hard core of the nursing and domestic problem of old age. Their precise numbers are impossible to determine, but they form a group of considerable size, which is destined inevitably to grow at least in step with the disproportion between the old and the working-age populations. Within the whole group of old people the isolates form a special cohort of paramount social importance.

The patterns of physical and mental breakdown among the isolates are, of course, the same as for those living in a family circle; but [illegible] ensure a prio[illegible] loads the [illegible] chnical poin[illegible] oidable [illegible] makes it essential to take special [illegible] the future are to be given a fair chance of carrying their share of the common problem, and there is great need for more special accommodation and such domestic assistance as will enable the stay of isolates in hospital to be governed only by their medical needs.

The isolates make a special appeal to our sympathy in that as a group they are so liable to suffer from loneliness. Quite apart from its pathos the mood has a practical importance, for all observation suggests that its long continuance depresses their mental vigour, and that its relief does much to improve their vitality. The discovery of many of these old people is not easy, but the pathos of loneliness

and the preventive importance of its relief are such that the various bodies which actively concern themselves with the matter are indeed taking part in the formation of a true social philosophy of old age.

The Family

We now come to the most numerous class of all, those who are
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consequences. Such facts as that 40 per cent. of old people have depended on regular contact with their children, and that as much as one-quarter of their nursing when ill at home has been supplied by neighbours, speak for themselves; and the fact that we are able to manage at all depends on these fruits of social cohesion.

The time is past, however, when they can continue to be taken for granted, for among those with first-hand experience there is an ominous concord of agreement that these sentiments seem to be declining; put bluntly, they speak of an increasing tendency for children to regard the care of an aged relative whose management at home has become tedious or difficult as the proper concern of the State. It would, however, be premature to accept this diagnosis without the most careful scrutiny. Before we start to blame the family spirit, it is well to remind ourselves of the scale of the stresses that may be cast on the younger generation who undertake the care of an ailing and aged relative.

The first is that of duration, for while the period of final incapacity may be short it may also last for anything up to fifteen or more years. The second stress may arise from the nature of the illness. If it be physical, the load may vary from the trivial to the severe, as is entailed by the home care of the bedridden or incontinent.

equanimity, particularly when someone has to keep the peace

fined to the house is very relevant. All these difficulties are accentuated if housing conditions be unsuitable or the younger woman is having to supplement the family budget by some form of occupation.

Hence it is not surprising that, however willing the family may be to shoulder their responsibilities at the beginning, the time is apt to come when the household reaches a state that has been aptly called "emotional sensitisation," when they suddenly feel unable to continue any longer. It is also not surprising that in 1946 some 7 per cent. of the old people were transmitting to the younger generation strains of such severity that they robbed life of all its normal meaning. Since this then represented three times as many old people as were accommodated in public institutions, the size as well as the severity of the load carried by the family can be appreciated, and it is perhaps unfair immediately to assume that any subsequent

Housing

The architectural handicaps are especially important and operate in two ways. The enormous building developments in this country since the war have been devoted in the main to the needs of the immediate family of parents and children and are not necessarily so well suited to the care of three generations. One way in which many families used to cope with this problem has unintentionally been made more difficult by the shift, mainly of the younger generation, out to the new dwellings. Both the old people and their younger relatives are agreed on the layout most suitable for many families, which can be summed up as one of independent propinquity—*i.e.*, separate establishments sited reasonably close to each other, so combining the advantages of independence and ready mutual aid. The movement away of the younger generation inevitably leaves more old people who can no longer depend on the ready accessibility of their children; but it is essential to recognise this aspect of the natural history of old age and to assist a desire of the two generations to live close to each other, for otherwise we are depriving ourselves of what has hitherto been one of the principal methods by which so many families have elected to care for their old people. The difficulty is accentuated if the younger woman happens to be in employment; for her available time may no longer allow her to supervise two households, as she often used to do when they were more or less contiguous. The same two reasons—the employment of women and the unintended sundering of human ties by a population shift—have also tended to deprive the community of a proportion of the

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A Partnership

Where does the truth lie? After all these factors have been taken into account there remains little doubt that we are witnessing a shift of family emphasis in relation to its ageing members. This shows itself in practice by an increasing demand for the hospital treatment of illness in its old people, and at times by a reluctance to face the years of servitude which so many families have seen so many others undergo. Nevertheless as a practising physician I am still prepared to declare a deep faith in the existing sense of family loyalty. The sentiment certainly lies deep in human feeling, but it has not the compulsion that attaches to, say, the maternal instinct. It takes its roots in a warm background of family affection during early life, and to be effective it has to be a natural product, for it is not to be elicited by intellectual argument in later years. We are, in fact, dependent at the moment for the care of the majority of our old people on the love and sense of duty which they themselves transmitted to their children, and for any weakening of those bonds forged in early life the community would pay a price later on. All of which only goes to emphasise the truth that family life lies at the core of national life.

We must, I think, recognise the implications of the existing situation and accept those social facts, such as the economic freedom of women, which to attempt to stem would be like rebuking the tide. We must see that the family is no longer left to face its difficulties in the obscurity that comes from being taken for granted, but is acknowledged as the essential partner of the community in a common enterprise. We must see that help is given to the family in the places it is most needed. This means assisting the two generations to live close to each other when they so desire, and developing the facilities for periodic relief, which entails an expansion of domiciliary help and the freest possible turnover of hospital beds. These in turn involve a determined attack on the isolates and the fullest co-operation between official and voluntary agencies; but nothing makes a family more willing to continue the care of an aged and difficult relative than the knowledge that the community will recognise the need for holidays and for assistance during phases of a final illness which are causing overpowering domestic stress.

I am sure of one thing—that the virtues of the human spirit expressed in the determination of the old to keep going to the last possible moment, the sense of family loyalty, and the unselfishness of good neighbouring are still with us. But to borrow a homely analogy from the gardening catalogues, while the first of these may be regarded as a hardy perennial that can be left to fend for itself, the others are only half-hardy and need attention. The only hopeful and, indeed, realistic way of facing the future is for the community on the one hand and the family and friends on the other to join in an active partnership in the care of their old people; for it is quite certain that, no matter what the country, neither can manage it alone.

CHAPTER I

AGE AND SOCIETY

Introduction to Social Policy and Problems

SAUVY, A., Paris. *The historical and sociological basis.*

Our society is paying ever keener attention to the problem of old people, to the place they hold, or should hold, in society. Even though this concern is not as strong as it should be, it contrasts with the very slight importance which our ancestors, even in fairly recent times, gave to this question.

One must then assume that some evolution has taken, and is still taking, place which has had the effect of altering our ideas in this field.

The better to see the nature of these fundamental changes, let us recall the three successive ways in which society has looked after its old people. These can, in fact, be separated into the family phase, the individualist phase, and the social phase.

The family phase—A large number of problems which to-day are described as social were formerly resolved within the framework of the family. This was notably so with the care of old people; consequently such care was scarcely of interest to society as a whole.

The essential characteristic of the family, even more accentuated in modern times, is the absence of financial considerations since ther[illegible] of any hard and fast rules. Family society is suffi[illegible] legal and financial niceties. [illegible] authority withi[illegible] himself made sure of his [illegible] the work of others. When he lacked physical or [illegible], authority passed to his son without there necessarily being any formal abdication. The levy which he exacted in services or in kind on t[illegible]ork of the community slowly became an allowance, a gift, of v[illegible] younger generation. [illegible] law and decided solely [illegible] not always made without difficulty. But society [illegible] concern itself with these internal difficulties and, consequently, took little account of the care of old people, such a task being delegated after a fashion to the family, that small autonomous society.

We should add that the proportion of old people was fairly small and [illegible] profound changes. Doubtless the situation [illegible] another, from one generation [illegible] But the system was sufficiently pliable to [illegible] that they did not indicate any fundamental trends.

This family stage has extended up to modern times, especially in rural communities, which until recently accounted for at least three-quarters of the population.

The individualist phase—Towards the end of the eighteenth century, society, as it were, started to advance. Technical and scientific progress little by little dislocated the thousand-year-old institutions which were based on stability.

The evolution of ideas in an individualist direction had been neither foreseen nor suggested by the numerous utopians of the

tions and the growth of urbanisation separated the generations. The young family frequently lived in the town while the old father was left in the country. Later the town family, now grown old, found itself in turn separated from the children, at least from the point of view of housing.

Professional dispersion was added to *geographic dispersion.* The family ceased to work as a family; the man went off to work in one factory, the wife in another—and solidarity suffered.

Now family solidarity *does not thrive except within the home and at a common task, because only with difficulty can it be put on a financial basis.* Besides it is psychologically harder, sometimes much harder, to provide a monthly pension in kind than to share a meal around the family dining-table.

2. The geographic dispersion of the family was accompanied by a *decrease in paternal authority.*

This decrease, which was part of the general pattern of enfranchisement, was accompanied by an emancipation of the wife and children.

3. The possibility of safe financial investments.

Formerly it would have seemed absurd for a poor family to save in any other way than by buying a piece of land.

The first real savings bank was established in 1798, for children, at Tottenham. The savings banks were apparently a social and philanthropic institution. In fact they allowed the richer classes to consolidate their position by giving the poor an opportunity of escaping from a certain amount of misery and by taking away from them an excuse for their poverty. On the other hand, state funds and state obligations were "democratised" in the nineteenth century. So, theoretically, a new solution was being found for the care of old people. It was sufficient for everyone to keep their old age clearly enough in mind to save the necessary fraction from the fruits of their toil.

"grasshoppers," that was about all. Such assistance was limited to the minimum necessary to soften the cruelties of the system so that the richer classes would not suffer from them.

Certainly individualism has existed both alongside the family phase which preceded it, and the social phase which was to succeed it. Without having been able to pursue its own particular logic to the end, its influence on institutions, on ways of seeing and of

counting, has penetrated sufficiently deep to have been the cause of errors of thought which still persist to-day.

The social phase—One can argue how long a run the individualist system might have had in a world without wars or monetary crises. Personally, I believe that the war of 1914-18 merely accelerated an inevitable evolution. The first workmen's pensions date, in any case, from long before the First World War.

However this may be, the old person often found himself in the most terrible want; bad investments, depreciation of money, a clamping down on rents, and also sometimes insufficient savings.

The ageing of the population, a subject to which we will come back, had the effect not only of upsetting the numerical proportion between adults and old people but, what is less well known, of reducing the vitality of the population and of contributing to the decline in monetary power. At least that is what has happened in France, a country in which old age is in the van.

It was therefore necessary not only to come to the help of people in distress, but to construct a new system based this time on solidarity between the generations. This is the social stage of which social security is the essential instrument.

But, in order to follow aright the lot of old age, we must now consider the demographic evolution.

[illegible] of demographic ageing [illegible] that a rigid definition has been considered unnecessary.

Let us take for criterion the proportion of sexagenarians in the population: At the end of the eighteenth century, this proportion was about 7 or 8 per cent., hardly more than one meets to-day in under-developed countries. Later on the proportion increases first in France, then in all the western countries.

Here are the dates at about which, in various countries, the different stages of ageing have been or will be reached:—

Percentage of Sexagenarians.	France.	Sweden.	England and Wales.	Germany.	Italy.
8	1790	1850	1910	1911	1860
10	1850	1882	1925	1925	1908
12	1875	1912	1931	1937	1952
14	1931	1940	1938	1951*	1964
16	1950	1955	1952	1959*	1972
18	1964	1955	1962	1964*	1988

* Western Germany after 1945.

The underlying fundamental movement is bound to continue in spite of the accidental fluctuations due to war. With the "biological death-rate" (as defined by Bourgeois-Pichat) towards which the various countries are tending, and with a birth-rate which

just about ensures the replacement of one generation by another, [illegible] o 110 years, a [illegible] be about the limit for the human species. A stationary population would then include 45 per cent. of sexagenarians and 27 per cent. of octogenarians.

The increase in the number of very old people or octogenarians is more important even than the increase of sexagenarians.

One can get an idea of what the population was like before the industrial era by cutting out, in one's thoughts, nine octogenarians out of eleven in the population of to-day and by increasing from [illegible] gives way to real anxiety, even anguish, when, at the same time, one sees man's indifference to a movement which reaches to his very heart.

The causes of ageing—The ageing of the population does not, as is often thought, arise from a lowering of the mortality rate. An examination of the table given on the opposite page is sufficient proof of this. France, which is in the van, did not show a lowering of the mortality rate before the other countries; it is her birth-rate that has fallen. On the other hand Italy had a first wave of ageing in the nineteenth century, a result of the young people migrating.

The fall in the death-rate has saved as many, if not more, young people as adults. Its action on the redistribution of the age groups has been practically nil until now, showing itself, if at all, in the direction of a rejuvenation. One must take care not to confuse ageing of the population with lengthening of life. If the average age has more than doubled in two centuries, it is because many young children have been saved.

The essential cause of an ageing population is sterility. The number of children that a married woman bore in the course of her life was on average between five and six. But of this number more than half died before reaching the age of procreation.

It is certainly true that families of eight and ten children were [illegible] The distribution of families [illegible] lepended more on mortality, [illegible] marriage than on voluntary sterility—the principal cause in our days.

The average number of children born to a married woman has altered from five or six in the eighteenth century to about two or three in the western countries of Europe. So that it has dropped by half in less than two centuries.

The lowering in the mortality rate has nevertheless had an indirect effect on ageing, by contributing to the fall in fertility. Let us consider the average family in bygone days. It was necessary for the mother to have five or six children in order to rear two or

the near future: the ample generations born around the turn of the century. Falling death-rates also are likely to be a factor of [illegible]

[illegible] more progress will be made in controlling the degenerative diseases of later life and increasing the proportion of elderly people who live on to a ripe old age, thus contributing to the rise in the proportion of old people.

How much higher will the rates of aged population rise during [illegible]

projections made by the Royal Commission on Population show an i [illegible]
in th [illegible]
the [illegible]
fron [illegible]
year [illegible]
patt [illegible] pid rate.
[illegible] the aged will
be r [illegible] sent, so far as the developed countries are concerned. I should like to comment briefly on the implications in one field, namely, the effects of ageing on the ratio of dependent groups to producers in the population. I think this is a factor of some importance affecting production and the level of *per capita* income. From this point of view ageing in the developed countries has had on the whole a favourable economic influence in the past, helping them to achieve their present enviable standard of living as well as a more leisurely life than was formerly possible. Although the decline of birth-rates in the long run increased the ratio of people at or near the age of retirement, it had a more immediate and larger effect in reducing the proportion of young children in the population. Consequently there was a net increase in the share of the population made up of adults in the working ages, and a reduction in the average number of dependants per worker.

Now the sacrifice which workers have to make in order to support a given number of dependants varies with the standard adopted—for instance, with reference to education for the children and services or income maintenance for the aged. These standards have risen quite considerably in the past. Furthermore there has been a lengthening of the periods of life, both in youth and in old age, during which it is socially accepted that a person may not be engaged in income-producing work. So the actual burden of dependency has not been lightened as much as the population figures would imply. But on the other hand, one may say at least that the *responsibility* for dependants, considered in terms of their real needs rather than of what they actually get, has been lightened considerably.

Looking at the matter from this point of view, we can get a fair idea of the effect which ageing has had upon the dependency situation by comparing the relative numbers of both children and the aged in countries where ageing is most advanced and in those where it is least advanced. Two examples will be sufficient: Great Britain and Brazil. The ratio of persons over 65 per 100 persons 15 to 64 years old amounts to 16 per 100 in Great Britain and only 4 per 100 in Brazil. But the ratio of children under 15 is only 34 per 100 persons 15 to 64 in Great Britain, while it is 75 per 100 in Brazil. In sum, the ratio of persons in the two dependent age groups combined to the population of the productive age group amounts to about 50 per 100 in Britain, but 80 per 100 in Brazil. It appears that some ageing of the population would be a useful economic prescription for countries like Brazil. It would be particularly helpful in easing the difficulty of providing adequate education for the children.

If ageing has hitherto been advantageous from an economic point of view in the countries where it has advanced farthest, the continuation of the trend in the future will not be so advantageous for them. In most cases the further increase in the percentage of old people is not likely to be balanced by a comparable reduction in the percentage of children. Henceforth the ratio of dependent to productive age groups will rise gradually in countries like France, Great Britain, and the United States, unless the productive group is extended by means of later retirement. Within the foreseeable future the amount of increase in the dependency ratio will not be great in any case. No country will become an "old people's country" during the twentieth century, at least, but some will change from a structure of population with regard to age which is highly favourable from an economic point of view to one which is still favourable, but somewhat less so.

Of course, it is not impossible that an extreme degree of ageing [illegible]

course of time. Professor Sauvy has shown how wide are the limits of possibility with his example of a population in which everyone lives to t[illegible] which su[illegible] 40 per ce[illegible]

I think this example is instructive. If everyone lived to be 110, at what age would men become old, and at what age would they normally retire? Surely not at 65, nor yet hardly at 75 or 80. Presumably a man at 80 should be in a fair state of preservation if he is to live thirty more years, and he would presumably be able, [illegible] useful work. The idea of his spending [illegible]

that a living standard acceptable to all could be maintained with only, shall we say, half of the potential manpower employed—for in that event each worker, the young as well as the old, would have a just claim to his share of both the leisure and the work. We may presume that society would insist on whatever provisions might be necessary, in the fields of education, health maintenance, employment practices, etc., to make sure that men could keep on functioning as useful and productive members of the community, perhaps until 90 or 100 years of age. And if this should prove impossible, we may well imagine that the extension of life itself would be refused and men be put to a more timely death by law.

If the economically "advanced" nations have not taken any very radical steps to utilise old people's abilities more fully, we may conclude that it is because they have not been compelled to do so by the force of circumstances. Thanks to their high average production per employed worker and their still favourable ratio of dependent to productive age groups, they have felt no overriding necessity for vigorous action on this score, except in time of war.

KING, Sir GEOFFREY, London. *Policy and practice.*

Introductory—Before we can think of translating policy into practice we must make sure we know what our aim is and what our policy should be. If in general terms we define our policy as being an intention to make old age as tolerable and pleasant as we can, then many things will have to be done which will call for social decisions of the widest possible character extending far beyond mere financial arrangements.

The existence in a community of a large and growing number of old people creates strains and tensions which affect the life of the citizens at many points. There is no single solution of the problems thus created. Old people are not an isolated group with needs which can be separately labelled and dealt with apart from the needs of the community as a whole. They are a heterogeneous group of individuals most of whom have the same kind of needs as the rest of the community; they are not a problem to be solved but part of the general stream of community life. An increase in the number of old people will tend to increase the number of people who can no longer play their part as producers and will become consumers of things produced by others. Their standard of living in old age will depend on how much the more active members of the public are prepared to set aside out of current production. This is a "social" rather than a "financial" question because it

expenditure on drink, tobacco, and private motoring and travel—which can scarcely be regarded as essentials—has risen by nearly £400 million. One cannot divert all this money to old people by any wave of a magic wand; but can anyone doubt that if the community had chosen to use part of it for old people they could have been provided with a higher standard of living without any strain on its resources?

Communities will provide for old age in various ways. In an agricultural or peasant community old people tend to remain until the end as useful members of a family group carrying out such [illegible]

forced upon us by the demands of a modern industrial community and by insistence on independence and individual rights to the neglect of duties and obligations. No one in these days would dare publicly to advise young married couples to live with their parents. To set up a household with one's parents is regarded as a hardship, and psychologists and psychiatrists never tire of warning us of the tensions and strains such an arrangement creates. In the old days [illegible] in the neighbourhood [illegible] labour is the cry and [illegible] of work. These are [illegible] *ndustrial community,* but they add considerably to the difficulties of providing properly for old age. Family ties which for generations were recognised as [illegible]

concerned.

The practical approach—An administrator entrusted with the duty of making provision for the old people in a community will probably start by asking himself some such questions as: What do old people need to enable them to live tolerable lives? How shall we decide on the standard of existence to be provided for them? [illegible]

intended, some thought is necessary in defining what we mean by "old age" or "old people."

There have been two main lines of approach. Some people argue that the mere attaining of a particular age, 65, 60, or whatever it may be, brings about such fundamental changes in the individual's position in the community as to call automatically *for some special*

provision. Doctors give no support to this view. On the contrary they urge that people of these ages present as wide a variety of types as those of the previous decade. It would indeed be surprising if a worker of 64 automatically became a senile incompetent at 65 and still more perhaps with women at 60. None the less there is still a considerable body of opinion which favours old age pensions to be granted at fixed ages. The alternative approach is to regard old age as potentially one of the reasons why men and women may no longer be able to provide for themselves and to make provision accordingly in the shape of retirement pensions payable only to those who give up work.

The choice between the two systems involves a number of difficult social issues. If pensions are to be given automatically at fixed ages can they reasonably be provided at subsistence rates? Is it a reasonable use of a community's resources to provide that the worker who continues in full-time work and has had to rely on his wages during that period of his life when he is bringing up a family, and his expenses and incidentally his ability to enjoy life are at a maximum, should suddenly be given a substantial subsidy by the State when he reaches 65? Is there not a risk that this will produce a class of subsidised wage-earner which may have a depressive effect on wages generally? Will it not make the drop to reliance on pension alone all the more difficult when the inevitable moment arrives for giving up work? If the "pension" for the man at work is to be a token amount only and not the subsistence pension provided for those who must rely on it for livelihood, what exactly is the object of rewarding survival to a fixed age by a bonus of this kind? To make the pension depend on retirement from work also raises some difficult questions. Presumably retirement must be voluntary—it must not, that is to say, be the equivalent of inability to go on working, a question which doctors would in most cases find it impossible to answer with any certainty. But if retirement is to be voluntary will the existence of a pension conditioned by retirement tend to induce people to retire who might otherwise have continued at work to the advantage both of themselves and of the community as a whole? Are people who have retired to be allowed to earn any money at all, and if so within what limits? It would be a strange doctrine to insist on a man retiring from the job he knows most about and where he can best serve the community and then to allow him in "retirement" to take up some other work and earn as much as he would have done at his old job. Yet where retirement pensions are provided there is constant pressure to allow pensioners to earn more and more while drawing their pensions.

The choice between the two alternatives also has some bearing on the apparent size of the burden which old age imposes on the community. If the approach is by way of retirement pension for those who give up work, then the charge these people will impose on the resources of the community becomes part of the much larger charge which the community has to bear in providing for those who

even in the next twenty-five years the increase in the number of persons of ease in the nun look depends lar the number of children requiring education, the community will be content to leave the school leaving age where it is or raise it still higher. If it is raised the number of dependants will, of course, be substantially increased. Figures regarding the increase in the number of pensioners are often presented in the form that whereas at the beginning of the century the ratio in this country between people of pensionable age and the rest of the community was 1 to 17, in 1961 it will be 1 to 6. These figures are used to emphasise the greatly increased burden which the growing number of old people

absent from work every day through sickness or injury. Their absence frequently causes loss of production far greater than the individual's own efforts might suggest, because it upsets teams of workers and makes extensive rearrangements of labour within the

It would take too long to develop this point, but some interesting figures have lately been published showing the enormous improvements which have recently occurred in the length of working life for those of middle age, and no one can doubt that further improvement is possible.

The needs of old people—For the most part old people need much the same as anybody else—food, housing, clothing, warmth, and so on—but old people also tend to have special needs just because they are old. As they grow older people become less and less able to look after themselves. They must be helped in their own homes or they may have to be cared for in hostels or institutions. From every point of view—the wellbeing of the old people themselves as well as the economical use of the community's resources—the easier it is made for people to go on living in their own homes and in their own surroundings the better. They will be happier there, and the more old people do for themselves the less will be their demands on the services of others.

Although a good deal has been done in recent years for old people, the emphasis on the part both of State authorities and of

voluntary effort has been mainly on the provision of hostels for those thought to require special care and attention. This is understandable, because it is much easier to produce quick results in this [illegible] built and opened with appropriate publicity [illegible] nothing having been done. Nor is [illegible] though it is perhaps open to doubt whether the [illegible] the most deserving cases and whether a good deal of the accommodation thus provided is not taken up by people who are really quite capable of looking after themselves. To accommodate old people in hostels is very expensive, largely because it is necessary to provide and pay a staff of people to do the cooking, housework, and other things which old people in their own homes do for themselves. Not nearly enough attention has been paid to ways and means of enabling old people to continue living on their own as they have been accustomed to do all their working lives. Home helps, meals on wheels, clubs where they can meet are all being tried and undoubtedly make their contribution; but the need for a comprehensive study of the comparative cost of providing more help in the home instead of moving the old people into hostels is clamant. Here, too, is a field with endless opportunities for voluntary effort. It would be impossibly expensive to provide enough paid help to look after old people in their own homes, but a great deal could be done for them if friends and relatives would undertake to spend an occasional hour tidying up the house, cooking meals, or doing the shopping. Then there is a real need for simple "gadgets" which would ease the burden of life for old people half crippled by arthritis or similar complaints.

Housing—*The division of the accommodation needs of old* people into homes for those who can live their own lives, hostels for those who need some care and attention, and hospitals for those in need of medical attention is too well known to call for further elaboration. I would, however, like to emphasise two points connected with housing. There are far too many old people occupying more accommodation than they really need. In my own village there were recently three cottages in a row; two of them were occupied by single pensioners and the third by ten people belonging to two separate families. Old people have their obligations as well as their rights, and if they demand of the community to be provided with the means of livelihood they ought to be prepared to recognise the needs of the younger generations in cases of this kind. It is partly the result of the system of rent restriction, which prevents rents rising to an economic level, and partly the outcome of that insistence on individual rights and independence to which I drew attention earlier on. The other point I want to mention arises out of the creation of new towns and housing estates in more or less remote areas. The accommodation provided in this way is naturally and very properly given to young workers and their families. But the separation of the generations is having some odd results. The young mother can no longer ask granny

to pop round and look after the children when she goes out; and granny, left behind in the old town, no longer has her daughter at hand to help in time of need. In this way we are, potentially at least, creating a demand for two sets of paid workers to replace the services which the family used to provide for itself—" sitters in " for the children and " home helps " for the grandparents. An interesting example of what a well-known philosopher had in mind when he defined social reform as the process of creating the social problems of to-morrow by measures designed to solve the social problems of to-day.

To an audience such as this I will not presume to say much about hospital accommodation. It does, however, look as though something rather simpler is needed for old people than the very elaborately equipped, and therefore very expensive, modern hospital when they become infirm.

Income provision—People will need an income on which to live in old age and it may be assumed that the community, through government, will have to make some provision for it. The big issue here is whether the income provided by the community is to be in addition to any income the individual is able to provide for himself or, in whole or in part, in substitution for it. From the individual's point of view the object of savings and pension schemes is to give him the right to make claims on the productive capacity of the community in years to come. Should the State undertake simply

origin in the idea that it was the duty of each man and woman to provide for his own future, and it was reasonable for the State to give facilities for doing so. What is generally overlooked is that pensions drawn in the early days of any such scheme will be very far from having been paid for by the pensioner's contributions. If the pension in such cases were to be limited to the equivalent of the contributions paid, it would be a very modest pension indeed. If, therefore, pensions paid through the insurance scheme are to be any use at all in meeting need, the great bulk of them will, for many years after the start of the scheme, have to be provided by the community at large out of its general resources. The Government Actuary here has, for example, recently stated that only about 5 per cent. of the value of current pensions has been provided by the workers' contributions. The doctrine of pensions as of right in return for contributions thus relates to the distant future, but it is treated as though it was in full operation to-day.

In a modern community no pension scheme by itself can hope to provide adequately for everyone. For one thing rents vary so widely that a pension which would be sufficient to enable the pensioner to pay the rent demanded in one of the large cities would be very much more than is necessary to provide an adequate living

to a person in a country cottage. For this reason alone every State pension scheme must be backed by an assistance scheme under which the needs of individual pensioners can be assessed and met within such limits as may be thought appropriate. The two main types of schemes for providing old people with an income are therefore insurance and assistance. Insurance provides a pension of definite amount for the worker without regard to his other resources or to the circumstances in which he lives; assistance sets out to make up the resources of the individual to the amount required to enable him to live on a reasonable standard.

There is no doubt about the general dislike of a " means test," though at first sight it very aptly carries out the doctrine of " to each according to his need," and it certainly makes the best use of any money available for old people by giving it to those who need it most. The risk of relying on insurance is that while the amount of the pension will tend to be determined on the basis of the requirements of those with no other resources, it will in many cases be paid to people who have built up for themselves many other claims on the country's current produce in the form of savings, private superannuation schemes, and endowment policies. If the provision of these additional sources of income in old age is left entirely at large the total cost of providing for old people may in time become very much greater than is realised and a position may be reached where a man's income in retirement is greater than his earnings at work: such a development could hardly be a healthy one.

There are several types of pension schemes. Some of them provide a flat-rate pension in return for flat-rate contributions;

earnings, averaged over his whole working life or during the latter part of it. One cannot be dogmatic about the choice between the flat benefit and the proportion-of-wages types of scheme; as an administrator all I would say is that the complications of changing from one to the other frankly appal me. In this country we chose the former largely, I imagine, on historical grounds. It serves to provide the necessary minimum on which the worker and his employer in the more highly paid industries can, if they choose, build up to the level of pension required. I have had no experience of the other type of scheme. I have always understood that where it is used it has been found necessary to underpin it by a minimum rate below which no worker's pension will be allowed to fall whatever his wages may have been and also to impose a maximum on the amount payable. In so far as these limits operate the scheme is in reality one for a flat-rate pension, but I do not suppose they affect more than a small number of cases. A scheme of this kind does on the face of it offer one great advantage. It makes it unnecessary to reach an arbitrary decision as to what the rate of pension

should be and thus avoids the constant pressure which is experienced under the flat-rate type of scheme for higher pensions.

This necessity of fixing a rate for pensions under the flat-rate scheme is the cause of a good deal of misunderstanding. One hears a lot about the "subsistence level" as though it were some figure which could be scientifically determined. The truth is that there is no such thing as a subsistence level which would be universally applicable. Science may tell us how many calories, vitamins, and so on we should consume to keep us in good shape. It can say nothing about whether we "ought" to get the necessary nourishment in the form of potatoes or other cheap foods or in the more expensive form of choice steak. A subsistence diet is simply the type of diet which is conventionally acceptable in the particular community at the particular time. During the war, in this country we did remarkably well on a diet which in certain important respects was below the minimum standard diet produced by the British Medical Association before the war. If that is true of food it is still more true of things like clothing and household needs which cannot possibly be measured scientifically. All that can be done in fixing a rate of pension is to relate it to the amount which people with modest incomes are accustomed to spend on the various items which go to make up their standard of living. This will obviously vary widely between different communities; even inside a single community, if it is a large one and includes people with widely different standards of living, the choice of a suitable flat rate may be almost insoluble. A sum that would be barely adequate for the town dweller might be almost beyond the dreams of avarice to people accustomed to a low peasant standard of life. To some extent these embarrassments are avoided by making the pension depend on the wages, but not entirely if it becomes necessary to provide a minimum rate below which no pension is allowed to fall. From the administrative point of view it has always seemed to me that the flat-rate scheme must have many advantages. It is relatively simple and makes it unnecessary to keep elaborate records of wages. When the time comes to award a pension it can be awarded quickly and no elaborate calculations of wages over a long period are called for.

State pension schemes also differ in regard to the way in which they are financed. We, for example, have the flat-rate contribution system with the contribution based on an actuarial calculation of the amount required to pay for the pension of the person who contributes throughout working life. Others use the device of a special social security tax and others again pay pensions out of general taxation. I hardly think this is a subject to be discussed in any detail in a gathering such as this. The choice must to a large extent depend on the economic and social history of the country concerned and on the method it adopts to finance government expenditure. We have found the flat-rate contribution system acceptable and workable. It suffers perhaps from the defect of

making the well-to-do pay the same as the poorest wage-earner, and it is not easy to see how, without radically altering the basis of the system, one could give similar rates of benefit for differential contributi
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is far from true in the early days. No one now drawing a pension has paid more than a very small fraction of its real cost. A man who has been insured since contributory pensions started in this country will not have paid much more than £50 towards the cost of a pension worth at least £800 or £900. For the woman the amount paid is less and the value of her pension, bearing in mind it is payable at 60, is much higher. Every increase in pension rates adds to the burden on general revenue in two ways—immediately, so far as existing pensioners are concerned, and potentially for the great bulk of workers who will never pay the new rate of contribution for the full term.

If the issue as between the contributory system and the special tax is complicated, the question whether the income derived should be funded is even more so. Funding of pension income is a matter for actuaries and financial experts. I will, however, mention one or two more general points about the position of the funds in our own scheme. It is true that we have substantial funds, but this is largely an accident. These funds were to a large extent taken over from the old Unemployment Fund and were built up during the war, when there was little or no unemployment. Their growth since the general scheme started in 1948 is also due to the fact that unemployment has been much less than was expected. We have no separate pension fund and all income is paid into the one account. Even so the fund, large as it is, is only a small fraction of the actuarial value of commitments already made for pensions, which has been estimated at somewhere in the neighbourhood of £15,000 million. Even if pensions remain at their present level we shall very soon reach a point where outgoings will exceed income and it will then be necessary to decide what to do about the funds. All these questions are being examined by an expert committee at the moment and I do not think I can say more about them now.

As an alternative to either funding or the ordinary contribution method, there is what is known as the assessment system. Under this system the amount required to pay pensions during the next few years—say, five—would be calculated and the total cost would be raised, either by contributions or by a special tax, equalised over the period. It would involve a gradual raising of the weekly contribution or tax as the pension bill increased as it inevitably must.

That bill will, however, have to be met somehow and the method has the undoubted merit of making it clearer to the general public what they really are having to pay by way of pensions.

CONCLUSION

Provision for old age has emerged as a "problem" largely because of the loosening of family ties and insistence on individual rights and privileges to the exclusion of obligations and duties which has developed so markedly in recent years. Whereas families used to accept responsibility for their old people they now expect the State to look after them, and old people themselves expect to have an income of their own in old age irrespective of the use they have made of their opportunities during their working lives. But old people are part of the community and their standard of life is inextricably bound up with the standard of the community in general. Insurance schemes are a convenient piece of machinery for distributing to the old people in the form of pensions whatever share in the country's income is allotted to them. They cannot in themselves provide old people with what they need. If the community pays its way and prospers, if prices are kept steady and inflation is avoided, then insurance schemes will function as intended. If, on the other hand, there is a steady process of inflation and prices [illegible] in a time of sharply rising prices and yet remain actuarially sound. If the pension remains at its original level it will quickly become inadequate. If pensions are raised to meet the increased cost of living the contribution income will not be sufficient to pay them and an increasing burden will fall on the general resources of the community.

Moreover, if old people are to end their days in tolerable conditions far more is needed than a mere money income. The care and attention which the family used to provide for them must be provided in some other way. Much more attention should be given to providing whatever help is needed to enable people to continue living in their own homes. The alternative of having to provide for them in hostels or institutions is very costly and a rather more generous attitude towards domiciliary help of all kinds may well prove to be good business as well as true humanity.

TITMUSS, R. M., London. *Some fundamental assumptions.*

In meditating upon the theme and purpose of this Congress, I was led to wonder [illegible] as a delegate [illegible] policy and the [illegible] I also want to [illegible]

understanding of his
would, I think, have
some amendment to
and the Aged Poor"
poor are remarkable for the number of promising paths that lead nowhere." * Some of the paths which Sir Geoffrey has sketched for us would, I feel, have been commended by Booth. But other paths which are being advocated and pursued in Britain to-day, and which no doubt will be strongly supported at this "international hunt for the deserving aged" (to paraphrase Robert Louis Stevenson), would not have been regarded by Booth with much sympathy. For Booth always turned a shrewd and critical eye on the pretentious and the patronising who wished to impose on old people a pattern of life which they themselves had no thought or intention of following. There is more wisdom about old age in his little book of eighty-four pages than is to be found in most of the

for the individual old person. His point of departure was always the individual and the "little things they care about"; not the industrial system, or efficient administration, or neat concepts of insurance. He wanted honourably to endow old age through general taxation; not to force old people to retire to obtain a pension or to drive them, through fear, to save for old age. It was not then in his philosophy to speak, as many do to-day, of old people as a burden on society.

Had I the time I would have been tempted to speculate about the meaning of the swelling chorus of opinion in recent years which sees the needs of old age as a burden on society. What motives impel these grim predictions about our economic future? Why are our criteria of social value in old age increasingly restricted to the asceticisms of industrial productivity? Nor are these notions expressed solely in economic symbols. At the Annual General Meeting of the Royal Economic Society in May of this year there was a strong demand from the platform for old age pensions to be "taken out of politics." This proposal to disenfranchise pensioners because of their growing voting power was, in effect if not in purpose, a proposal to remove a substantial proportion of poor people from the electoral roll. No doubt it was unintentional, a temporary surrender to the economists' unconscious; nevertheless it represented, at any rate by implication, a demand for a new poor law in Britain.

So much by way of introduction. Now I want to provoke a little controversy. I want to examine one or two of the more fundamental assumptions about old age which are in current circulation to-day. As generalisations they often remain unexamined, concealed

* Booth, C. "Old Age Pensions and the Aged Poor," p. 33, 1899. London: Macmillan.

by a noisy barrage of faulty statistics. They need challenging, for they are important in any consideration of policy and practice.

First, there is the assumption that elderly people are living much longer. From this it is argued that, on average, old people are healthier to-day and that, again on average, the span of working life should be extended. As regards standards of health, there is little evidence about the past or the present which is worth the name. The only trustworthy data we have and on which we must rely in the absence of other evidence are the "expectation of life" figures; that is, the average future lifetime to be expected by a person aged x if subject to the death probabilities of a specified period. In 1910-12 the expectation of life of a man aged 65 in England and Wales was eleven years.* To-day (1950-52) it is eleven years and nine months.† A gain of nine months in forty years is not spectacular—particularly when we reflect on the so-called scientific revolution in medicine during the last decade or so—and hardly merits the term "medicated survival." In Scotland the gain is even smaller. For women of the same ages over the same period in England and Wales the gain is just under two yea

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First World War was only a little less than old people surviving to 65 to-day. These, of course, are all average values behind which lie many differences. Some parts of Britain and some broad occupational and income groups record a lower expectation of life at 65 for both men and women to-day than the national average in 1910-12.

In the face of these figures it would hardly be astonishing if health—or ill-health—were not the major concern to-day of the majority of men and women of these ages. Sub-standard health in old age may simply reflect sub-standard health in childhood and middle life. "One sees yet again," wrote Dostoievsky, "that the whole of the second half of human life generally consists of the habits acquired in the first half." Old age does not create new problems of health; it only deepens old ones.

and Women ‡) and who wish to do so should have the freedom to continue in work. It is a freedom which for some is lacking to-day.

* English Life Table, No. 8.

† General Register Office. Quarterly Returns for England and Wales, pp. 2 and 3, December 1951.

‡ Cmd. 8963, October 1953.

But for others, who probably constitute the majority, there is as yet little support from the available evidence for a policy which would impel, through the indirect pressures of economic need, more old [illegible]

of real resources.

There are two further assumptions current to-day which I wish to challenge but, again, with extreme brevity. The first of these is the idea that we have moved (or are moving) from a "normal" population age structure to an "abnormal" one. This is not so. In a stable "life-table" population the "normal" proportion of people aged 65 and over would be somewhere between 13 to 16 per cent. according to the mortality probabilities applied.* To-day it is 10·9 per cent.† Not for another twenty years are we likely to reach a "normal" age structure. What, in fact, we are now discovering is not that we are an elderly nation but that Victorian society was extraordinarily youthful. The industrial system is only now awakening to the fact that labour costs cannot be terminated when workers reach the 60's and are no longer so useful. In the nineteenth century these social costs were evaded ‡; to face them now, in any society, is a painful experience.

Finally, I wish to say a word or two about the widely held assumptions concerning the weakening of family responsibilities. This is an important matter, for it bears on the many practical issues of housing, hospital provision, income maintenance, and community care. But what are the facts? What little evidence there is—and it is extremely meagre—can hardly be said to support or refute the general assumption. The only piece of evidence which may appear significant is that, as far as I can ascertain, the proportion of people aged over 65 accommodated in hospitals and institutions of all kinds is lower to-day than it was when the Royal Commission on the Poor Laws reported in 1909.§ The Majority Report attributed a serious rise in old age pauperism to the "growing attractiveness of Poor Law institutions" and to a "decrease in filial duty." The Commission wished to reassert the "natural feeling of responsibility between parents and children." Behind the assumptions about filial duty in those days—and even more so to-day—is the further assumption that all old people have children on whom they can turn for support. What we have to realise, however, when we come to consider some of the practical questions of domiciliary care, income maintenance, and so on, is that a substantial proportion of elderly people have no children to assist them in time of need. Roughly,

* See "The Growth of Pension Rights and their Impact on the National Economy: A Study by the Institute of Actuaries," p. 3, 1954.

[illegible] In

[illegible] ırers

of all men and women aged 65 and over in Britain, 1 in 4 or 25 per cent. are in this situation, either because they have never married or because of childless marriages, some of which will have been broken by widowhood.* To me, when I came to work it out, this proportion seemed remarkably high. The high figure of old people who have no children to whom they can turn for support is in part a reflection of low marriage rates in the past. Indeed, we are still having to meet the costs of a huge debt of unmarried domestic servants of Edwardian days.

live independent lives in their own homes.

BURGESS, E. W., Chicago. *Human aspects of social policy.*

OLDER persons have essentially the same basic values and wishes as all other human beings; and there are indications that older people are increasingly dissatisfied with their dependent, detached, ... society. The public, however, ... economic and health phases,

...—In the United States the ... can best be understood by ... These

... he rural ... ace permitted by the horse and buggy. Intimate personal family and kinship relationships predominated. Each neighbourhood tended to be a homogeneous cultural unit. The urban way of life is symbolised by the range and nature of social contacts made possible by the automobile. Impersonal, standardised, and mechanised relationships tend to predominate over the intimate personal relationships of the old-time rural neighbourhood.

Older persons have lived through these changes. Their habits, values, and ideals have remained to a greater or less extent those of the earlier era. They find their ideas and ways of life stigmatised as out of date and old-fashioned by the younger generation.

2. *From self-employed to employee*—In a rural society adult workers are largely self-employed. In an urban economy the great majority are employed by others. The farmer is not only the head of the family but the owner and manager of his own enterprise and the supervisor of the work of his sons. His status in the family and the community is quite different from that of the unskilled ...

worker in an industry. The teen-age son of the industrial worker may, soon after he goes to work, earn as much as or more than his father. *It is understandable how the decline of farming and the* growth of industry has been accompanied by the diminishing stature of the family head from self-employed to employee.

3. *Economic security no longer self-assured*—Ownership of a farm or small business gave the ageing person economic security. He could reduce his hours of work to his declining strength. He could arrange for his sons, hired man, or tenant to carry on the major operations of farming. He could completely retire from work with the knowledge that his wants would be provided for and that his status was secure.

How different is the position of the older person in the city! The depression of the thirties gave convincing proof that reliance solely upon one's own efforts gave inadequate economic protection to the great majority of employees. Even to-day in the United States one-fifth of all retired persons are on old-age assistance.

4. *From cultural homogeneity to cultural diversity*—In the United [illegible] even more than in other countries, the cultural [illegible] in the transition from [illegible] [illegible]e city [illegible] [illegible]l-time [illegible] [illegible]pecial- [illegible] [illegible]herish different values, and to spea[illegible] [illegible]othesis should be investigated that the greater the cultural differences between the older and the younger generation, the greater will be the social distance and the points of conflict between them.

5. *The shift from the primary to the secondary significance of human relations*—In the rural neighbourhood of the past, social relationships were kinship centred. Naturally, where familism predominates, the role of grandparents was clearly defined. Their power was great an[illegible] status was high.

In the urban w[illegible] more and more take second [illegible] he basis of occupatic[illegible] of ideas and values. Family and kinship [illegible] are no longer central and vital. The result is that the older person feels dethroned and devalued in the realm of family relations where he once reigned supreme.

In a relatively short period of time the change in the position of the older person in the United States has been almost catastrophic. He enters old age no longer as self-employed and master of his economic fate. *He is now an employee and can be retired under* conditions dictated by an employer. Culturally he is dated. The [illegible] passed him by. He is out of touch and [illegible] Finally, [illegible] patriarch

in ordering the destiny of his children and grandchildren. He cannot even be sure of being venerated and respected. In short, he has lost his old role of dominance and has not yet found a new one.

A first step in redefining the role of older persons in modern society is the examination of their attitudes and desires.

Attitudes and desires of older persons—The human aspects of the problem of ageing are to be seen most clearly in the attitudes and desires of older people. Not all the attitudes of older people can be [illegible]

being " old " or " aged."

2. *Recognition as individuals*—Older persons resent being lumped together into one group after [illegible]
age such as 65 years. They [illegible]
persons with individual diffe[illegible]
productivity.

3. *Interest in new knowledge about ageing*—Interest is increasing among older persons about the knowledge that physiologists, clinicians, psychologists, and social scientists are discovering about the ageing process.

4. *Participation in planning for the welfare of the ageing*—Older persons are asking to take part and are participating in the making of policies and of programmes for older persons.

These attitudes could be further elaborated and others added. The above discussion will suffice, however, for the purpose of this paper.

The values and basic wishes of the older generation do not differ from those of children or of other adults. Old people desire, in common with all human beings, (1) to engage in meaningful [illegible]

ageing people.

1. *Meaningful activities*—Recent studies have shown what are the meanings of work for persons who have retired or are about to retire (1). The findings of research indicate that work is not solely or even primarily a way of earning a living. It is a way of life by which persons regulate and routinise their time, associate with fellow-workers, make use of their skills, gain recognition, achieve status, nurture the feeling of usefulness, and find self-expression in creative activity and in service to others.

Certain of these meanings of work, of course, find expression in non-work activity, as in association with friends off the job, in

membership in voluntary associations in the lodge, in the union, and in the Church. Practically all of these meanings may and often are found in leisure-time activities. Indeed, recreation becomes a major way in which workers when they retire may find substitute activities through which they can find expression of the values which work formerly afforded them.

Retirement from work appears to be a crisis to the person in the degree to which he secured positive meanings in his work rather than in his other activities. In fact, retirement is less difficult if he found either no meanings or especially negative meanings in his work (2).

2. *The feeling of security*—The transition from a rural to an urban civilisation undermined the older type of economic and mental security enjoyed by older persons. They became the most insecure group in our society. No longer economically independent, a growing number of older people found themselves increasingly uncertain about economic support from their children. Even under Social Security many older persons find their income insufficient to meet a subsistence level of living, especially in a situation of inflation and rising prices.

But the insecurity of older persons is not merely economic. It is psychic and social. This psychological insecurity arises out of their uncertain and deteriorating role in society.

Our American society tends to regard older persons as "retired from life." They have "had their day." They are "has beens." They are admonished to accept the situation, to resign themselves to it, to "grow old gracefully."

It is understandable, therefore, that in interviews retired persons speak with bitterness and defeatism of being "discarded," "put away on the shelf," and "let out to pasture." Some reconcile themselves to sitting on the front porch in a rocking-chair and [illegible]

[illegible] their uncertainty about the future. This feeling appears to centre about the growing [illegible] when the home of [illegible] of life, or at all e[illegible]

[illegible]

between the closest of friends. Sociability is manifested in social relations among friends and in intimate groups, particularly with one's age peers. Persons as they grow older suffer the loss by death of aged parents, of brothers and sisters, of spouse and of children. They lose contact with friends of their youth and middle life by death, by moving away, and by other contingencies. Many older persons find it difficult to make new friends. Loneliness becomes one of the tragic consequences of ageing (3).

4. *Identification and participation*—The identity of the person is closely bound up with his membership and participation in institutions and other organised groups. The majority of older persons contract rather than maintain or expand their social participation. Certain of these losses of identification are forced upon the person. Compelled to retire with abrupt notice, he may feel a grievance against the company which leaves him with no sense of emeritus status. His union may no longer permit him to attend meetings or may have no provision for him to receive the news bulletin. He may for financial reasons have to give up membership in clubs or in other organisations which make no provision for emeritus status. There is *a need, therefore, on the part of older persons for identification* with and participation in groups which have a real significance for older people.

The above analysis of the basic desires of older persons— [illegible]

[illegible]

1. *Work*—The values in work have vital meaning to older as well as to younger people. *Every effort should therefore be made to* enable older people to continue working (4). Many companies and other organisations still permit workers to keep their jobs as long as they are productive. The policy of compulsory retirement at a definite chronological age should be re-examined (5). Research should be undertaken to discover, if possible, objective criteria of ageing which could be substituted for chronological age in determining retirement (6).

The feasibility should also be considered of half-time and other part-time work suited to the declining strength and energy of retired workers. Many older workers upon being retired secure new employment or devise opportunities for self-employment. Moosehaven, a home for aged members of the Loyal Order of Moose, [illegible] programme as an integral part of its [illegible]

reasons, many prefer to retire. These, together with those who retire involuntarily, constitute the "new leisure class" (8). No longer bound to their place of work they are free, within the limits of their means, to live where they

and secret ambitic

in trailer parks in

persons fish, play bingo, resume or take up square dancing, learn social dancing, and, in smaller numbers, enrol in classes in crafts,

of the basic desires which were formerly, at least in part, fulfilled in work.

A policy of promoting the well-being of the ageing should give high priority to the recreational interests that are meaningful to retired persons.

3. *Economic security*—The one objective of social policy for the well-being of the ageing that has almost universal acceptance is economic security (9). In times past that was supplied to ageing parents by ownership of property and by their children. To-day, even in the land of rugged individualism, the United States, the national government has acted to insure the provision of economic security to persons 65 years of age and older through assessments equal in amount upon employers and employees.

Our legislation on Old Age and Survivors' Insurance is based on the assumption that the role of the national government is to guarantee to all covered workers and their wives and dependants a minimum of subsistence. It is the lowest level of protection against the contingencies of old age. At present in the United States this amount ranges from $25 to $85 a month for the individual worker and from $37·50 to $127·50 for a couple. The bill now under consideration by Congress would raise this from $30 to $98·50 for the individual and from $45 to $147·75 for a couple. For those retiring after the passage of the legislation the maximum for a person would reach $108·50 and for a worker and his wife over 65, $162·75 (10).

A second level of provision of income for older people is being sponsored by the voluntary action of companies and organisations on either a contributory or non-contributory basis by their employees. These company pensions or insurance arrangements provide varying monthly payments. They are either supplementary to Old Age and Survivors' Insurance or in addition to them. Only a fraction of workers, mainly in large industries and companies, come under these benefits. But these pension plans seem to be steadily increasing in number (11).

money and kind by children, other relatives, and friends. Some 40 per cent. of men over 65 continue working. The majority of these older men work full-time. Accordingly, while they continue making social security payments they receive no benefits in any month where their earnings exceed $75 in covered employment. Persons at 75 years of age, however, receive Old Age Insurance benefits no matter how much they earn from gainful employment.

Few persons or couples can live adequately if their retirement income is limited to the first level, at that which is received from the Government. A welfare policy must therefore emphasise also the

programme.

4. *Psychological security*—The anxiety of older persons about
One means
stereotypes.
ed by older
to learn";
behave your
age"; "chronic illness is incurable"; waiting for death."

A second means is within the action of older people themselves. It is the demonstration of their capacity to produce and to contribute to society. They can be inspired and heartened by outstanding

community has its aged men and women who remain active and useful.

economically over those who rent.

With advancing years and with ill-health it becomes increasingly difficult for older persons to maintain an independent existence in their own homes unless they are financially well situated. In the past, and still too often at present, the alternative was admission to a home for the aged or to a nursing home. Now the value to the person of remaining in his own home as long as possible and by all possible means is being recognised and put into effect.

In carrying out this new objective Henrietta Herbolsheimer, M.D., of the University of Chicago Medical School, has coined the term

" gradient of services " in the continuum from the home to the institution :—

(*a*) Home maintained without outside help.
(*b*) Home maintained with housekeeping and/or visiting nurse service.
(*c*) Home in a single dwelling or apartment in a sponsored community with provision for infirmary care.
(*d*) Small efficiency apartment with common dining-room or nearby restaurant facilities.
(*e*) [illegible] mber.
(*f*) [illegible]
(*g*) [illegible] ıp to [illegible] with infirmary.
(*h*) Institutional home, a large structure with rooms for fifty or more residents, with large dining-room and infirmary.

These eight points on a gradient are from the most to the least home-like in physical structure and facilities. The concept of a gradient also indicates the desirability of preserving so far as possible at every point the features and atmosphere of home. Even in the large institutional home permission to bring in some furniture of one's own will make a room more home-like to the resident.

6. *Family relations*—Relations with one's children, grandchildren, and great-grandchildren are of primary significance for older persons. The old pattern of relations recognised the dominant position of the grandparents. The new pattern that is emerging is based on the autonomy of both the older and the younger generations. As one older gentleman phrased it, he had to shift his role from being a father to being a friend to his children. Many of the difficulties in inter-generation relations are due to the transition from the older to the modern pattern of relations.

Special points of conflict centre about the care and discipline of children. Grandparents may either spoil grandchildren by over-indulgence or be outraged by the permissive way of child-rearing which now prevails. They may resent being relegated to the role of baby-sitters while their children spend frequent evenings away from home.

A social policy should take into account the findings of research [illegible]

friends to replace those that are inevitably lost. Membership in informal social groups and in formal organisations is one means to this end. The rapid growth of groups made up mainly or entirely of older persons is helping to meet this problem. The names of

these organisations are interesting: half-century clubs, golden years clubs, new horizons clubs, senior citizens, etc.

Of particular interest in relation to friendship is the development of trailer-park communities in California, Florida, and the South-west. One of these, Bradenton (Florida) Trailer Park, inhabited by over 2,000 retired persons, has been studied (13). An outstanding feature of mobile-home living is stated by residents as " sociability." *Trailerites find it much easier to make new friends than in their* home community. Being retired, they have time to be " friendly." Living in close proximity, mutual aid becomes an obligation that is cheerfully fulfilled.

8. *Maintaining membership in organisations*—The role and status of the person depends in part on the organisations with which he is affiliated. Organisations should provide even more than at present emeritus status for members at the age of retirement with nominal or no dues.

An item in the budget of retired persons should be for dues in

and uselessness may be poignantly acute. The retired person now has the time to give to activities and organisations. He subscribes to a magazine, *Lifetime Living*, especially addressed to him. It presents monthly a panorama of activities, adventures, and opportunities for older people.

A new organisation, Senior Achievement, Inc., has recently been formed in Chicago. Its purpose is to help older people to develop industrial enterprises of their own, to preserve their health, and to be protected against illness, to promote co-operative housing designed for older people, and to form educational and cultural groups to express their interests.

CONCLUSION

This outline of a social policy has implicit in it certain points which should now be made explicit.

First of all, the problems of older people transcend that of economic support, although financial provision is fundamental to the solution of their other problems.

Third, companies, unions, and community agencies should provide counselling services and conference discussions on planning for retirement.

Older people, in [illegible]
rights, are in one se[illegible]
of the population ; [illegible]

increasingly sympathetic hearing from the general public.

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KARSTEN, ANITRA, Helsinki. *Psychological aspects.*

WE are accustomed to hear about problems like the burden of old [illegible]

psychologists are in a much more unfortunate position than either the statisticians or the administrators. We have made neither a survey to serve as an introduction to a proper investigation of the ageing nor an investigation of the labour force and its powers of work, particularly in the higher age groups. Both of these are necessary not only for a better understanding of the labour potential of older workers, but also to be able to contribute to the success [illegible]

have to consider old age from the point of view of the individual's value to the community. As soon as a person is of no more use to the community then he is considered to be old. But we must note that in some societies we find that people like to become old. That [illegible]

old and to have leisure. The goal a person sets for himself is influenced by the standards of the group to which he belongs or wishes to belong. Professor Kafka has shown that adults up to 50 in Europe tend to think of themselves as younger than they are. After that they are inclined to underestimate their capabilities.

The conditions in which people grow old determine whether they are going to retrogress or to improve. And so the ultimate responsibility for postponing regression lies with the community. If I may, I should here like to mention a small point. The mere change from rural to urban ways of life alone does not account for the change in human relations. Even in an urban society we find groups where old people may keep their status. Large-scale employers retain their patriarchal role, however old they may be. Then there are the professional people who advance to leading positions, however old they may be, in politics, in administration, in education, and so on. Thirdly, we have a group of unskilled workers who may go on working very long; and if they cannot continue at their old job they may change to something else. In [illegible]

comparisons that we find out the *real conditions and needs of the* older people. It would be most valuable if this Congress could [illegible]

[illegible] urban way of life [illegible]

far consists only of comparisons between groups of younger and older people. I could, of course, mention many investigations which have been done but perhaps you will allow me to mention one investigation we are doing in Finland.* We have compared the conditions for old people in different communal homes with

* A. Karsten, "Åldrandets psykologi," *Geron* (Yearbook of the Societas Gerontologica Fennica), 1 1949; "Age and Work-Potential," *Geron* 4-5, 1952-53.

conditions in their own homes, and we have compared different homes, each one with different rules or psychological barriers and varying degrees of privacy, security, or frustration; we have found that these barriers correspond to and affect the level of retrogression in the individual. As a result of living under such conditions barriers are created which narrow the movements or psychological locomotion of the individual, so that his freedom of behaviour, thought, an[illegible] If the freer conditions which exist in priv[illegible] state-owned old people[illegible] Recently the attitude [illegible] changed. Many people, even at a comparatively [illegible] that it is the State's *duty* to look after the *old*.

Failure to exploit properly the potentialities for labour in the older age groups does not only mean a decline in economic productivity but also a decline in purchasing power of a large part of the community and finally a growing burden in the form of subsistence grants from the State. Psychologically this further employment would lead to a greater satisfaction with, and a better adjustment to, life. In any case it is much too early in the light of our present knowledge to try and fix a definite age limit for new employment or retirement.

CHAPTER II

NATIONAL PROGRAMMES

ROTH, J., Zurich. *Old age insurance and welfare in Switzerland.*

In Switzerland, as well as in all other civilised countries, you can observe a steady increase of the oldest generation taking place with which the younger ones cannot keep pace; and the fact that these old people can earn their living only in a reduced way or even not at all gives a steadily growing importance to the question of old people's welfare. In 1900 the Swiss population amounted to 3,300,000, of whom 193,000, or 5·8 per cent., were more than 65 years old. To-day, Switzerland has 4,700,000 inhabitants, of whom 453,000, or 9·6 per cent., are more than 65 years of age. According to the latest calculations the number of old people will increase by about 10,000 persons each year and our country has, consequently, to face very serious and urgent problems in this respect.

The Federal Old Age and Survivors Insurance, which is one of the most important social improvements in Switzerland and which came into force in 1948, is still at an early stage. Full annuities will not be due until 1968; in the meantime partial or transitional annuities are being paid, but neither of these annuities are sufficient to enable anybody to live a life worthy of a human being. The supplementary annuities of the Confederation, as well as those which eleven of the twenty-five cantons or semi-cantons and a number of municipalities are granting from their funds to old people and survivors, are often not a sufficient supplement to the Federal annuity. In these cases Pro Senectute, the Swiss foundation for old people, together with its cantonal committees, will help by granting single or regular contributions. If all these sources cannot meet the old people's financial needs, the general public assistance will look after them.

The payments, calculations, premiums, etc., of the Federal Old Age and Survivors Insurance are, of course, identical in the whole territory of Switzerland. The *ordinary annuities* are graduated according to the average yearly contribution and, if the person insured has not contributed for twenty years, according to the time during which contributions have been paid. A limit for a maximum as well as a minimum annuity has been fixed (annuities range from 720 to 1,700 Swiss francs for single persons and from 1,160 to 2,720 Swiss francs for married couples). Single men and women must be aged 65 before getting their old age annuity; married couples are entitled to it when the husband has reached 65 and his wife 60 years. The *transitional annuities* are only graduated according to the place where people live—whether in a town, in a semi-rural, or a rural place. Every old Swiss citizen can claim them if he or she is not entitled to the ordinary annuities, and if his or her income and fortune do not exceed a certain fixed limit. The premiums to be paid are as follows: people working on their own account contribute up to a maximum of 4 per cent. of their income; whereas employees pay 2 per cent. of their wages, and 2 per cent. is paid by their employer.

The supplementary payments for the old people's welfare of the Confederation, which are distributed by the cantons and the foundation Pro Senectute, as well as the subsidies of the cantons, municipalities, and the cantonal committees of the said foundation, vary from canton to canton. The maximum supplementary assistance is given to the necessitous old inhabitants of the town of Zurich, who receive 120 Swiss francs a month if single (a married couple receive 200 Swiss francs) from the canton and the municipality of Zurich, in addition to the Federal annuity.

Apart from the Swiss Association of Gerontology, which has recently been founded and whose main activity will be scientific [illegible] Pro Senectute, founded in 1918, is the [illegible]

[illegible] purely private one; it is absolutely neutral with regard to religious denominations and political parties. It depends upon 3,000 honorary collaborators distributed in the whole country who help to reach its aim and who are especially devoting themselves to the case work. The right of decision, the direction, and administration lie with the cantonal committees, each to a great extent working independently or with the Directory Board of the Swiss foundation. Of course, all allocations are only decided upon and paid after a careful examination by the competent bodies and the collaborators, who work in close co-operation with the local offices of the Federal Old Age and Survivors Insurance as far as individual cases are [illegible] Office of Social Insurance regarding [illegible]

women of 60 to [illegible] prematurely infirm and not yet en[illegible] annuities; also [illegible] children and no[illegible] annuity for wid[illegible] but also necess[illegible] those whose country of origin has not yet concluded a reciprocal arrangement with Switzerland and who therefore cannot claim a Federal annuity. The need for such private old age care is great, as illustrated by the steadily increasing number of old people assisted since the introduction of the Federal Old Age and Survivors Insurance. In 1947 the foundation Pro Senectute paid to 22,387 people a total of 4,005,967 Swiss francs, and in 1953 to 25,135 a total of 5,459,336 Swiss francs. Only those old men and women who cannot be saved from resorting to the Poor Law, even if they were to receive a contribution from the foundation, will not be assisted, as the foundation's task is not the discharge of general public assistance.

Another kind of help for the old people, called in French *seniculture*, forms an important part of the work of Pro Senectute, and could be cultivated only to a small extent up to the moment of the introduction of the Federal Old Age and Survivors Insurance due to the lack of financial means, but is becoming more and more important. There are more and more old people with sufficient means yet who are lonely or left by their relations and friends. Our old men and women are not only entitled to material security but to a satisfactory life in their old age. In close co-operation with the Church organisations and women's associations, the foundation Pro Senectute has been working during the last five years along fresh lines: celebrations during Christmas time, conferences and other instructive or entertaining reunions, as well as outings, are indispensable to-day. The terrible loneliness of old persons is met by the visiting service and the foundation of old people's clubs. The honouring of their 80th, 90th, and 100th birthdays, diamond and iron wedding jubilees helps them not to feel quite lost and lonely. Besides, these commemorations serve to remind the family, the broad public, and especially the younger generations of the veneration due to our old fellow-men and the performances they have accomplished.

A further task of at least equal importance to the *seniculture* is to create possibilities for a significant *occupation* for old people, especially the retired persons who are in good health and still willing to do something. We must prove to them that they are not only esteemed but still useful members of the human society. A lot of the plans and projects have not yet been realised, but they are based on the observations and experiences made abroad, especially in Great Britain and Scandinavia. Workshops for old artisans, handicraft, and gardening courses and similar opportunities have been provided here and there, but more of them will have to be created; further, advisory boards are helping people to prepare for their approaching retirement.

Another very urgent and important problem is the *housing* of the oldest generation of our country. The building of small and cheap flats reserved for [illegible]
and Zurich and are no [illegible]
Aarau, has to be acce[illegible]
blocks for old people's houses or separate flats situated in quiet ground floors of ordinary blocks. Our main idea is to enable the old persons to live in their own homes as long as they are in a position to look after themselves; admission to a home for old people or a home for the chronic sick being regarded as a last resort.

In this connection should be mentioned the great practical value of two organisations whose aim is to render temporary assistance to old people in their own homes or own rooms by trained people. Whereas the general Home Nursing Service is at everyone's disposal, the specific Home Help Service for old people has only been introduced in the town of Zurich and is financed by the Church,

the foundation Pro Senectute, and other interested organisations.

in public and private homes for old people; in addition, there are about 7,000 beds in homes for chronic sick reserved for old people in need of nursing. Further, there are the hospitals, eighteen of which include a special unit for geriatric and the chronic sick. There are no geriatric hospitals in the pure sense of the word in our country. All these establishments are not yet sufficient in view of the steadily increasing demand, and a very big combined effort of public and private organisations will be necessary to meet the

about the possible solutions and duties connected with the welfare of old people; and last, but not least, to procure the financial means without which all these activities would be impossible.

RANDALL, OLLIE A., New York. *A national programme for older people: United States of America.*

No "national programme for older people," as such, exists in the United States. Through the federal government several national voluntary organisations, of which the National Committee on Ageing of the National Social Welfare Assembly is one, and through our several state political and other commissions, there are national and state approaches to the solution of older people's difficulties. In the United States the recent increase in the birth rate, regarded

sense alone suggests that the interdependence of the two is so real that neither can be neglected. It is likewise distinctly out of harmony with the principle of respect for the dignity of the human being, no matter how young, how old, or how insignificant, even though this principle becomes increasingly difficult to apply in relationships with older people in a culture still inimical to them. Despite the persistent practice of retirement at a given age, tantamount to social and economic rejection, older people at home are awakening to their own responsibility and ability to demonstrate a continuing value to society.

National voluntary organisations are all responding modestly but positively in their programmes of discussion, training, and services to the demand that older people be served as individuals with the capacity not only to profit by such service, but to continue to render service to others. The Division on Maturity and Old Age

of the American Psychological Association is promoting wider understanding of older people through its studies of their psychological needs and strengths. The federal Department of Health, Education, and Welfare formed its Committee on Ageing and Geriatrics, following the first National Conference on Ageing in 1950. For the social worker, the sociologist, the anthropologist, for agencies charged with special responsibilities for the family, there is no single facet of the changing pattern of our social living in the United States that arouses more anxiety than the effect of this change upon family life. Much of this anxiety revolves around the question of financial support of elderly parents by adult sons [illegible] Public assistance costs for the elderly individual [illegible] assistance programmes [illegible] s a renewal of effort to place upon you[illegible] port of their elders, measuring financial ability to assume [illegible] by the public relief standard of the community (always a minimum standard). The ultimate social cost of success in this drive will undoubtedly be to deprive children of opportunities and to lower the community standard of living wherever such rigid requirements are imposed. The National and State programmes of public assistance are either the first or last line of defence in our national struggle for security in old age, depending on one's point of view and one's need.

No old person in the United States needs to be a pauper to-day, if we define "pauperism" as a state of cashlessness. At the Third American Assembly in November 1952 it was agreed that an "important concern of government" is "to provide a favourable climate for economic security" through the protection of "the purchasing power of the dollar," the stimulation of "economic activity at a stable level," and the maintenance of "economic growth." This followed an expression of belief in the individual's responsibility to do for himself to the limit of his own capacities, of private [illegible] to supplement the individual's own efforts. The exist[illegible] on the Older Worker of the U.S. [illegible]. The role of government [illegible] ment tests, coverage of all employed and [illegible] n its social security programme of insurance was also discussed. Some of the suggestions of this Assembly have been incorporated into legislation and into administrative practice. Some have become law. Proposals for broadening social security coverage and increasing benefits are at this moment before Congress for action.

With the beneficiaries of Old Age and Survivors Insurance outnumbering the recipients of Old Age Assistance in many states, the question of how to reach older people with service as well as money becomes one of paramount importance. The President's Commission on Health Needs of the Nation in 1952, the American Assembly in 1952, the President's Health Message to Congress in 1954, the findings of the Commission on Chronic Illness, which is a

national voluntary group, all endorse the fact that the knottiest problem in serving the elderly from the national and local point of view is the care of the physically and mentally sick who are unable to care for themselves or to be cared for at home. Congress

necessity of a pragmatic approach to the health needs of old people. The philosophy of restoring to usefulness whatever physical and mental capacities the elderly individual has is effectively permeating the health and social services of most of our communities.

Over 90 per cent. of our older people live in their own homes, and there is in the United States a new consciousness that the building of good housing adaptable to the changing needs of the elderly may in the long run prove to be an economy measure. Specially designed low-cost housing is being built for a few elderly persons of low ... my own state 5 per cent ... people aged 65 years a ... in this respect by Grea ... in the United States. ... vorkers, and others are ... luntary basis in order to make such housing appropriate for old people for a longer period.

The 1950 amendments to the Social Security Act required the forty-eight states to have standard-setting authorities for institutional living arrangements when "substitute homes" must be used—by 1st July 1953. The National Committee on Ageing, after a considerable study of desirable standards, sponsored regional conferences of licensing officials and community organisations. There is promise of achieving a better quality of care of old people than we have had in the past.

Throughout the United States, clubs, centres, and "activities" are being set up to satisfy the needs for recreation, education, and spiritual guidance of the individual. They have been established under such a variety of auspices, and naturally vary considerably. Leadership is provided often by trained group workers, adult educators, and by volunteers who find a rewarding outlet in this

guidance is doubtful. The National Committee on Ageing, unique in its broad representative membership, is, within its limitations

giving considerable help and guidance to local agencies and communities.

During the last fifteen to twenty years a programme has developed of provision of homes for old people. About 7 per cent. of the pensioners are living in such homes, and about 4 per cent. of the old people around the age of 65 are living in particular residential homes primarily designed for old age pensioners. In addition, there are housing schemes of the Ministry of Housing, including the development of places whereby first-floor flats are allocated to pensioners.

Our people are covered by the general National Health Insurance and the individual home care scheme, which includes home nursing, domestic help, etc. Old age pensioners in our country form a very strong pressure group, and their particular stated needs are for individual care and for increase in money allowances.

For a summary of the public and private pensions available in the U.S.A., see the paper by Emeritus Professor E. W. Burgess on " Human Aspects of Social Policy," chapter i, page 49.

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GAUSTAD, V., Oslo. *Scheme for co-ordinated hospital and home services for the aged in Oslo.*

The elderly have a claim on the following: (1) Economic security;

In planning of the work for health in Oslo we intend to create three different administrative centres: (1) The geriatric department; (2) The registration centre for all elderly applying for institutional care; (3) The health and welfare centres.

The geriatric department has the following tasks: (1) Ordinary medical examination, treatment, and nursing; (2) Rehabilitation of [illegible]

[illegible]

and welfare enterprises a joint registration centre will be established. The medical part of the work will be done by the doctors of the geriatric department. The auxiliary services for the elderly living in their own homes are being administered by the health and welfare centres. These are run by voluntary organisations with municipal support. Each centre o[illegible] 20,000, *i.e.*, 2,000 elder[illegible] generalised activity inst[illegible] stressed. In this way home help, for example, may easily be changed for chiropody or friendly visiting. A fully developed health and welfare centre has sixteen different tasks, partly socio-medical and partly entirely social.

GOOD, JEAN M., Toronto.

In Canada there is no national organisation with respect to old people. Old age security is paid to everyone in the country over 70 years of age by the federal government, and the most received is $40 a month. There is no means test. In addition, each of the provinces has a scheme for old-age assistance for people from 65 to 70 years of age on a means test basis. Finally, people between 60 and 65 who have no means of livelihood receive from the Provincial Government approximately $40 a month. Thus in Canada $40 a month is the public provision for people in the old age group.

In the province of Ontario there is very little housing for older [illegible]

[illegible] requiring residential care, because there is little self-contained accommodation available. In addition, there is very little planning for the needs of old people. A peculiar position has arisen in Canada in that in some parts there are no old people while in other areas there is an undue proportion. Into some areas there has been an influx of young people so that a new community has arisen; in some places no one is over 45 years of age.

FRIIS, H., Copenhagen.

In Denmark the pension scheme is not based on the social insurance principle but is a mixture between the latter and the principle of national assistance. It covers all groups of old people and is limited in that income from work and from other sources is deducted according to the principles covering the basic pension rates. It provides for all men over 65 years and women over 60 years, and it is believed that those receiving pensions equal 60 per cent. of the population in that group. We do not think the benefits are very high: they are, for a married couple, about 45 per cent. of an unskilled worker's wage in Copenhagen. Nevertheless, this programme absorbs about 25 per cent. of the total social welfare expenditure in Denmark and forms 2 to 3 per cent. of the total national income during the year. Nearly all the political parties in Denmark have put forward a pension scheme covering everybody without any kind of retirement conditions, a programme which, if accepted, will come to its full development during a period of thirty years.

BRAVO, A. L., Chile.

In my country gerontology is not the main problem in social welfare. According to the last census taken in 1952 only 8 to 9 per cent. of our population were people over 60 years of age. A law was enacted in 1924 to provide social insurance covering sickness, maternity, and old age pensions. It was revised in 1952, and the

nurses, and social workers. In the event of death the funeral expenses are paid from available funds. There is a great shortage of housing for the population as a whole, and there has been no special housing allocation for old people.

WATERMAN, J. A., Port of Spain.

The medical services of this island consist of Government Medical

The social assistance departments are closely integrated at the periphery. There is a committee to advise the Director of Social Welfare, and there are sub-committees in all the areas. Anyone

seeking assistance can apply first to the Social Welfare Officer, who usually visits the person in order to assess home conditions and then reports to the District Medical Officer, who examines the patient. The reports of these two officers are then sent to the Chairman of the Advisory Committee and suitable provision is subsequently made for the patient including, if necessary, visits from the health visitor or the district nurse.

People of all ages are admitted to the " House of Refuge." The feeble-minded are also admitted, but in that case they have to be certified. They are not admitted to the mental hospital, because they do not need the specialised treatment available only in that hospital. In addition to the Government institutions there are several voluntary institutions providing accommodation for the aged, and the Red Cross and Women's Voluntary Clubs make arrangements for visiting old people.

ASTBURY, B. E., London. *History of provision for the aged in Britain.*

Prior to 1601 the duty of caring for the aged was almost entirely the responsibility of the Church and of the merchant or craft guilds. Broadly speaking, this care took one of two forms:—

First, housing: the provision of almshouses or colleges for destitute old people. Many of these mediæval almshouses are in existence to-day. Many of them have been modernised; but a great number still retain their primitive characteristics. Almshouses were a favourite form of mediæval charities. Craft guilds built and endowed them for their aged members: local communities built and endowed them for their aged residents. Thus we find to-day that the majority of almshouses require either a residential qualification or a trade or professional qualification. Many, but by no means all, are able out of their endowment funds to make

with modern thought. There are, for example, still " dole charities " which provide for an annual distribution of so many yards of red flannel, or loaves of bread, or gifts of coal. There is, for example,

one mediæval charity which stipulates that residents of its almshouses shall receive each day :—

> " A loaf of bread,
> 1 lb. of fish or flesh as the day may require,
> and a gallon of competent ale."

Many, but by no means all, of these old charities have been modernised under our *cy près* doctrine, which enables the trustees of a charitable trust to secure a variation of the terms of the trust deed when it becomes difficult or impossible to carry out the terms of the original trust instrument.

In the year 1601, during the reign of Queen Elizabeth I, the [illegible] compulsory Poor Rate was levied and overseers of the poor were established in every parish throughout the country. These overseers were empowered to provide accommodation for the impotent poor, among whom were included the aged. The Act of 1601 did not contemplate the provision of institutional accommodation for the [illegible] ovide [illegible] when [illegible]

These workhouses, colloquially known for many years as the "Poor House," provided accommodation for elderly people who could no longer lead an independent life. Many of these institutions were of the large old-fashioned type, built largely during the nineteenth century. In these, despite the devoted work of many Masters and Matrons, there was no attempt of privacy and the numbers housed made it difficult for the staff to take much interest in the individual. A few local authorities began to build small homes; but the total amount of accommodation provided by private philanthropy, local authorities, was very small and insufficient to meet the needs.

In 1908 the first Old Age Pensions Act was introduced and provided a small old age pension on a non-contributory basis to persons aged 70 and over up to a maximum of 5s. weekly, based upon a means test.

In 1919 the pension was raised to 10s. weekly and the maximum means limit was raised to £49. 17s. 6d. per annum. The disqualification of Poor Law Relief was repealed except where the pensioner became an inmate of a Poor Law institution.

In 1924 further modification of the means test was made by ignoring the sum of not more than £39 a year derived from any sou[illegible]

pro[illegible]

reg[illegible]

Relief disqualification was waived for a period of three months in the case of admission to an institution for the purpose of medical treatment.

In the meantime compulsory schemes of National Health Insurance and Unemployment Insurance had been introduced in [illegible]

or retiring.

In 1940 supplementary pensions were introduced. This new Act reduced the pensionable age from 65 to 60 for women who were insured in their own right or were the wives of contributory pensioners. A supplementary pension, based on a household means test, was also made available. In August 1940, when the Supplementary Pensions Act became operative, 275,000 pensioners were *receiving public assistance; but when supplementary pensions became* available, nearly one million pensioners qualified for a supplementary allowance, thus showing how much unrevealed need amongst elderly people really existed.

Now, under our social security measures, insured persons retiring from regular employment qualify for a retirement pension at any time after reaching the age of 65 for a man and 60 for a woman. [illegible]

In order to encourage people to stay at work after reaching the minimum pension age the pension is increased by 3s. per week for [illegible] of 65 and 70 [illegible] of 70 who has [illegible] 32s. 6d., plus [illegible] since reaching [illegible] arried woman [illegible], may become [illegible] f 21s. 6d. per [illegible] laiming retire- [illegible] may claim an [illegible] vife is residing [illegible] earning more than 40s. a week.

This is a very brief description of the statutory rights of the aged: *and we must now turn to the wider field of the schemes for the welfare* of the aged operated both by statutory bodies and private organisations.

one mediæval charity which stipulates that residents of its almshouses shall receive each day:—

> "A loaf of bread,
> 1 lb. of fish or flesh as the day may require,
> and a gallon of competent ale."

Many, but by no means all, of these old charities have been modernised under our *cy près* doctrine, which enables the trustees of a charitable trust to secure a variation of the terms of the trust deed when it becomes difficult or impossible to carry out the terms

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In 1924 further modification of the means test was made by ignoring the sum of not more than £39 a year derived from any

... under which the financial ... in changes were effected ... Great Britain. The Poor

CHAPTER III

INTEGRATION OF PLANS FOR THE CARE OF THE AGED IN HEALTH AND INFIRMITY IN THE UNITED KINGDOM

KEMBALL, Mrs MARY M. C., Manchester. *Introduction.*

I BELIEVE that there are three partners concerned in this work.

First, there are the families. We are agreed that it is desirable to keep the old people at home as long as possible, and that they should remain as active members of the community. The family has still something to give which no other source can give, and there is strong evidence that the family tie persists.

Secondly, there is the good neighbour and the voluntary body. In this country the voluntary bodies were almost the first in this field, and still the vast majority of clubs for old people are run by the voluntary bodies.

The third partner includes the great official or statutory services—the health, welfare, and hospital services. In this country there has, since 1948, been a very great extension of these services, and the fact that there might appear to be some divorce between the health and welfare services and the hospital services renders all the more important the need for their integration.

TOWNSEND, G. W. H., Aylesbury. *Making the most of institutional accommodation for the elderly.*

Introduction—We have in the United Kingdom a series of major services which, taken as a whole, can, and to some extent already do, cover the total needs of old people. There are the social security services to meet financial need; there are the provisions of the National Assistance Act whereby local authorities provide residential homes; there is a range of voluntary services of various kinds; and above all there is the National Health Service with its three main components—the hospital service, a local health authority service for preventive work and to help those who are sick at home, and a general practitioner service which enables everyone to have a family doctor. The problem is so to integrate these various services that the care of old people may in fact be fully covered.

I propose for the purposes of this paper to divide old persons into three classes: those who can be cared for at home, those who are not sick but require institutional care, and those who are sick.

The first class are to a varying extent the responsibility of local authorities and constitute a great potential liability, as sooner or later a considerable proportion of them will fall to be dealt with by institutional provision which may be the responsibility of either the local authority or Regional Hospital Board. The chronic sick are the responsibility of the latter, and the remainder can be admitted to hostel accommodation provided by the local authorities. The ever recurring problem of defining exactly who is chronic sick and who is a frail ambulant person is always liable to lead to difficulties and delays between the authorities.

As at present used, there is insufficient accommodation for either the aged and infirm or the chronic sick, and therefore any realistic attempt to deal with this problem must be in the direction of making

better use of existing facilities, taking every possible measure, on [illegible]

immediately.

Although this is a common-sense approach and looks obvious, it has not been easy to do it in the past nor is it easy to do it at present, since existing legislation makes the care of the acute and chronic sick the responsibility of one body—the Regional Hospital Boards—and the care of the elderly infirm the responsibility of the local authorities. It is the aim of this paper to indicate certain ways in which these difficulties may be overcome or minimised.

Field work in relation to institutional provision—One of the principal difficulties since the inception of the National Health Service Act in 1948 has been a tendency on the part of authorities [illegible] the local authorities and the Regional [illegible] simply because the measure from [illegible]

to either local authority or hospital board accommodation. The relatives must be encouraged in all suitable cases to regard the [illegible] in the same light as the admission [illegible]

that burden.

Incidentally, the help they may expect is considerable, since apart from the benefits of a state medical service many of the following sources of help are available in most areas, and in many *parts of the country other help is also forthcoming.*

Services available:—

Home help District nurses Health visitors Social workers Occupational therapists	Through local authorities.

it is rather early to assess the results of this experiment, some of its advantages have become apparent.

It seems that no old people have "fallen between" the two authorities, since the geriatrician's decision as to which is responsible is accepted by both. Much time is saved in individual cases since there is no longer an interminable exchange of correspondence on the merits of particular cases.

Old people resident in the hostels who have fallen sick and are in need of hospital care have been transferred promptly—either almost immediately or at least within a few days.

The number of old people waiting for transfer from hospital to hostel has been reduced—the only ones now waiting are those who need ground floor or other special accommodation.

The following analysis of the position at one of the local authority hostels (some fifty beds) seems to bear out the above contentions.

At one time in December 1952 sixteen of the residents were in bed and requiring nursing care. Six were cases of pneumonia and of these it was only possible to get one to hospital. One other patient remained in the hostel while unconscious for sixteen days before death, another died after being in gross heart failure for fourteen days—in neither case could a hospital bed be obtained. During the autumn and winter (1952) there were five deaths.

During last winter all cases considered to need hospital care were admitted. Usually the delay was not more than three days, but one non-urgent case waited for six days. There were three deaths in the hostel, two sudden and one after a very brief illness during which no attempt to obtain hospital admission had been made.

It must be emphasised that these advantages were obtained not by increasing the number of institutional beds but by making better use of them.

SUMMARY

An attempt is made to show that there are many advantages to be gained by throwing all classes of institutional accommodation for the aged and chronic sick into one common pool. Apart from fresh legislation the only practical way to do this at the present time is to appoint one person to have administrative control of all beds, and it is suggested that this person should be the geriatric consultant.

An experiment along these lines by the Oxford Regional Hospital Board and the Bucks County Council is outlined, together with the results up to date.

WALSH, R. C., London. *Medical care of old people at home.*

REVERENCE for old age is not a marked characteristic of contemporary life or of modern medico-social services. The elderly sick and infirm have become a problem of considerable magnitude as action trails

awareness. It is sometimes seen as a cloud no bigger than a man's hand, but its overshadowing challenge calls for imaginative response

It is the heartfelt experience of those with everyday contact with geriatric cases that charity ends in an institution but that humanity begins at home.

The choice between home and hospital treatment is rarely available, however. Lack of facilities in the former at present is far less pressing than is lack of accommodation at the latter. The problem is thus twofold. Firstly, to improve primary services in the beneficial environment of the home; secondly, to accord chronic cases hospital admission without loss of priority merely because of the factor of senility. This inescapably involves consideration of national policy.

Even when communal action lightens these two burdens their full force is borne initially by the family doctor. There must come to his aid such promotion and integration of geriatric services that what he considers best for his elderly patients can be accomplished without an exasperating expedition through a maze of the uncoordinated and unready.

Probable trends in general practice—General practitioners will agree that an increasing amount of their time is spent attending aged patients. This factor affects the general organisation of the work of the practice. It can be assumed that an increase in the proportion of the older age groups of the population is reflected in the age groups of his patients. Abstracts from " General Practitioners' Records " (Logan, 1953) indicate the extent of the problem.

Table I shows the total consultations, by three age groups, of eight representative practices in England and the average number of consultations per patient per annum. It will be noted that the average number of consultations in the 65 plus age group is markedly greater than in any other group. *Thus* :—

TABLE I

CONSULTATIONS BY AGE GROUPS (*after* Logan)

Age Groups (Male and Female).	Total Consultations in One Year.	Patients in Each Group.	Average Consultations per Patient per Annum.
Up to 14 years .	24,011	6,712	3·58
15 to 64 years .	66,328	17,957	3·69
65 years and over	14,400	2,696	5·34
Total .	104,739	27,365	3·81

[illegible]

some reservations of accuracy, the increasing amount of practice time elderly patients will require.

In the home the primary care of elderly patients developing confusional states or senile dementia falls to the general practitioner, and these cases are amongst the most difficult with which he has to deal. Relatives are rightly insistent that their old folk should not be removed to mental hospitals, because of the fear of certification; and there is a formidable body of opinion in favour of mentally infirm patients receiving treatment at a general hospital. Many of these elderly people with confusional states are manageable during the day but difficult at night. Experiments with day hospitals are being tried, but these do not, of course, offset difficulties experienced at night. Many of the psychoneuroses of the aged are caused by impaired blood supply to the brain, and any form of toxæmia, nutritional lack, or circulatory disturbance can precipitate a delirium reaction. These old people often live alone and are without friends, and there is no doubt that social clubs for the elderly [illegible]

and treatment of the elderly and infirm. I believe that this report laid undue emphasis on institutional care of the aged and that the responsibility of the general practitioner was overlooked in favour of the geriatric consultant in the geriatric unit. It was only when it was realised that the hospitals were not in a position to provide the necessary number of staffed beds that a period of retrenchment became necessary. It then became a matter of exigency to investigate not only how to keep old people at home but also how to look after them adequately. An attempt is now being made to accomplish this with the assistance of ancillary workers and equipment. The ancillary workers are in the following categories:—

1. *The district nurse*—She is by far the most important. The [illegible]

2. *The home help*—She will come to do the housework and shopping, and, what is extremely important although not officially part of her duties, she is a companion during some of the hours of the day.

3. *The health visitor*—She is now interesting herself in old people. There is obviously much she can do to help the general practitioner to integrate his team.

4. *The night attendant*—He or she has come into service in some parts of the country. The duty is that of a sitter-up on one or two nights a week to relieve members of the family and to enable them to have a night's undisturbed sleep.

The equipment which can be obtained by the general practitioner to assist him with home care is:—

1. *The loan of equipment from local authorities and the British Red Cross Society*—Apart from bed-pans and commodes, such articles as gallows can be installed to enable an elderly patient, perhaps with osteo-arthritis or hemiplegia, to sit up in bed or to turn over. Handles by stairs and over the lavatory can also be arranged in this way.

2. *Laundry service*—The difficulty in dealing with soiled sheets, blankets, and clothing of the elderly is a tedious problem. It is interesting to recall that in 1951 a laundry service was opened in Bristol, the money being provided by a grant from the National Corporation for the Care of Old People. It works by the same methods as the commercial laundrette, electric washing-machines being used. Collection and delivery of the washing are done by voluntary workers, who also assist with washing and ironing. I have known many cases where the offering of laundry facilities would have just thrown into the balance the decision whether or not an old [illegible] institution.

[illegible] ive available [illegible] ity following [illegible] ope of this, [illegible] xclude many

4. *Domiciliary consultant service*—It is always possible, through the hospital services, to arrange for any patient to be seen in the out-patient department of a hospital and transport is provided by the local authority where necessary. Nevertheless, this is a big upheaval for a sick old person and the National Health Service provides for a domiciliary consultant service. Thus the patient can be seen at his or her home by any consultant desired by the general practitioner. This does not involve their uprooting and a long wait at a busy out-patient department, together with ambulance arrangements. It would be only fair to acknowledge the help I have received from many consultants in medicine, surgery, gynæcology, and psychiatry by visits of this kind and discussions by the bedside.

5. *Meal service*—This service exists in many parts of the country, but it is not comprehensive at present.

With regard to specific treatment for the elderly, I would like to emphasise that I do not consider the diagnosis and treatment of the elderly in any way different from that of younger people. There

is an ageing process on the one hand and a pathological state on the other.

Various treatments can be carried out at home which previously were thought to be available only at hospitals. For example, wax baths can be arranged for the painful deformities of rheumatoid arthritis. Flexion contractures of the thigh due to osteo-arthritis of the hip can be straightened with a simple traction apparatus. Anæsthesia of the stellate ganglion in cases of hemiplegia and severe anginal pain is a simple procedure which can be done at [illegible]

changes had taken place in the cerebral cortex.

The present position can be improved upon considerably. More co-operation is necessary with the hospital services so that if the general practitioner feels that his elderly patient would benefit from hospital treatment this can be effectively arranged without the difficulties that exist at the present time. The general practitioner does not require a home visit by a geriatric officer but a hospital bed for his patient. It is the general practitioner who best knows his patients' medical and social conditions. Much has been done in the domiciliary care of the aged but there is more to be achieved. I hope one day to see full co-ordination of all the services which are available. When this has been accomplished we will have refuted the statement that doctors, through medical care and improved sanitation, are responsible for more millions living more years in increasing misery.

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EVANS, G., Chester. *Comprehensive care of old people: the role of the local authority welfare department.*

At risk of violating if not my terms of reference then their sequence I have relegated to the second part of this paper a dissertation on the residential service which is the main function of the local authority welfare department under the National Assistance Act, 1948. Believing that the use of that service should be exceptional rather than normal, I have preferred to place the main emphasis on preventive work and rehabilitation and to discuss first the measures in which official and voluntary agencies collaborate to maintain old people in their own homes. That that is where they are happiest [illegible]

in five years' time the number of persons aged 65 and over will be 101,000; if only 2 per cent. of that number require residential accommodation no fewer than sixty homes of thirty-four beds each will be needed to house them—and a further increase in the aged population is to be expected over the succeeding fifteen years. This [illegible]

scientific study of old age and of the factors maintaining health in the aged, and as not warranting popular pessimism about the growing economic burden of old-age dependants in the next twenty or thirty years.

PART I.—DOMICILIARY CARE

Welfare department's role: family responsibility—There is [illegible] the old [illegible] ne need [illegible] others [illegible] able to find. Between these two extremes lies a large group who, with assistance, can continue to live independently or within the circle of their own family. The role of the welfare department is largely that of a co-ordinator that receives information about people needing help and takes steps to see that they get it, so far as it is available from any statutory or voluntary service; an intermediary that has always the will and less often the means itself to provide what is needed. Sometimes it is a matter of a friendly talk with a son or daughter living locally or of persuading two or three sons and/or daughters to agree in turn to have the care of the aged parent for a [illegible] say that in my own [illegible] nce of any widespread [illegible] the flagrant case is encountered from which the deduction springs easily and perhaps naturally that filial devotion and responsibility are not what they [illegible] abundant evidence that generally [illegible]

short period or by helping the people concerned to find it elsewhere. [illegible] is [illegible] wn [illegible] lly [illegible]

Co-operation of welfare and health departments: notifying agents—There is essentially a close relationship and co-operation between the health and welfare services—sometimes, indeed, the two services are unified under one control. Cases within the notice of the welfare department who require domestic or nursing help are referred to the medical officer, who in his turn passes to the welfare department for investigation cases reported by his health visitors, district nurses, midwives, authorised officers, and mental health workers to be needing residential accommodation. Information about old people in distress frequently reaches the department from general practitioners, occasionally after they have tried unsuccessfully to get their patients into hospital; sometimes it is the welfare department which draws the attention of a general practitioner to some person registered with him who seems to need [illegible] members of local authorities and voluntary organisations, hospital almoners, officers of the National Assistance Board, the police and housing managers, sanitary inspectors, and other local government officials.

[illegible] in rehousing them in special dwellings such as bungalows, flats, and flatlets are considerable. Many more such manageable dwellings are needed, and not only for old people who are still living in their own homes. There are those in welfare homes who were received there for no other reason than that they were homeless; others have so improved as the result of care and attention that, given a small dwelling and perhaps one or other of the domiciliary services, [illegible] hostels as such, the co-operation of the housing and welfare authorities in some areas has led to an arrangement which is really an amalgam of the main features of hostels and special housing. [illegible]

two guest bedrooms. The tenants, who are selected after consultation between the two authorities, pay rent in the normal way; the welfare authority's contribution is by way of a grant towards expenses incurred by the housing authority in providing welfare facilities, [illegible]

[illegible]

of many activities amongst which housing is not at present the most ubiquitous. The provision of almshouses for aged people by pious benefactors and trading fraternities goes back to the sixteenth century, and it has been computed that over 12,500 persons are accommodated in this way in England and Wales. During recent years a number of voluntary housing societies have carried into effect schemes for providing suitable accommodation for the elderly, either by building new dwellings or by acquiring existing properties and converting them into bed-sitting-rooms with communal kitchens and bathrooms; usually one of the tenants acts as warden and lives rent-free in return for cleaning the communal parts and general supervision. One such scheme, providing homes for women, is operated jointly by a housing authority and a voluntary society, [illegible]

[illegible]

window-cleaning. At a most economical cost schemes of this kind, which usually include also a visiting service, provide all that is needed by a large number of elderly people who otherwise would either have to continue in unsatisfactory or unhappy conditions or be rece [illegible]

[illegible] issued to welfare aut [illegible] rew attention to "services of the more personal kind which are not covered by existing statutory provisions and which indeed can probably best be provided by voluntary workers actuated by a spirit of good neighbourliness." Services of this kind have, of course, for many years been given by national bodies such as the British Red Cross Society, the Church Army, St John Ambulance Brigade, the Salvation Army, the Society of Friends and the Women's Voluntary [illegible]

[illegible]

county committees have been formed, the latter being charged with

the duty of stimulating the growth and co-ordinating the work of local committees and acting as the liaison between those committees and the statutory authorities. Over a thousand local committees are now functioning. The statutory welfare authorities have co-operated in the stimulation of local interest and the formation of county and local committees; indeed, members of the authority are often also members of the voluntary committees. Under Section 31 of the National Assistance Act, 1948, welfare authorities may contribute to the funds of any voluntary organisation providing meals or recreation for old people; the authorities may also contribute towards the administrative expenses of the county committees, under Section 136 of the Local Government Act, 1948.

Visiting—Probably the most valuable, and often the most appreciated, service which can be rendered to old people living alone is visiting. In a number of county boroughs the welfare department has compiled a register of old people living in their own homes and arranged by various means for them to be visited at reasonable intervals. Few, if any, welfare departments could organise a visiting service of any practical value without outside assistance. Usually the department's visiting list does not extend much beyond its waiting-list for residential accommodation, although as many "follow-up" visits as possible are made to all cases notified as needing help. As far as blind persons are concerned—and the majority of them are old people—a register of their names is compiled [illegible] welfare authority and they are visited regularly by Home [illegible] may be employed directly by the authority [illegible] experience in blind [illegible] arreed [illegible] go I [illegible] ected by her marr[illegible] com-modation but unwilling to accep[illegible] about 5s. a week, and welcoming the departmen[illegible] ly as someone to talk to, without expectation of any kind of material assistance, nor indeed a willingness to receive any. The effect of loneliness in old people has been graphically described by Lord Amulree: "It can lead to a degree of unhappiness that is dreadful to witness and to a physical and mental decay and disintegration which leads to the rapid onset of a really senile state, when all self-respect is lost"; and by Dr Trevor Howell: "These lonely old people . . . easily become 'frail lonely old people,' and from this it is but a short step to being 'sick lonely old people,' with no one to look after them." Visiting is therefore very properly regarded as one of the main duties of local voluntary committees. In many cases it naturally amounts to a great deal more than a friendly chat, helpful and beneficial though that in itself undoubtedly is. It is an opportunity for ascertaining the other needs of old people, for calling in where necessary the medical, health, and welfare services, for assisting with shopping, letter-writing, and domestic work, and

advising on pensions and assistance grants. The importance of this service was stressed by the Minister of Health at the recent annual meeting of the County Councils Association. "Here," he said, "is the great field for voluntary help . . . we ought not to rest until we have established a visiting service capable of visiting about once a week every old person living alone who might be in need of help."

Meals, laundry, chiropody—After visiting, probably the three [illegible]

[illegible]

meals to pensioners, sometimes under arrangements made between the owning authority, the welfare authority, and a voluntary organisation. Some of the clubs mentioned in the next paragraph also provide hot midday meals for their members at cheap rates. For house-bound old people in a number of areas, meals-on-wheels services have been organised, notably by the W.V.S., the B.R.C.S., and the Salvation Army, hot meals being delivered at midday by van on one or two, sometimes as many as six, days a week. Another much-needed relief is help with the weekly wash, which many old people are able neither to cope with themselves nor to pay the cost of sending to a laundry. A number of voluntary organisations have undertaken laundry services for old people or are collaborating with municipal authorities in this direction; in some cases help with laundry is given to relatives having the care of incontinent [illegible]

[illegible]

and light refreshments. It would be difficult to over-estimate the [illegible]

[illegible]

which follows up absences by discreet inquiry, much can be done to prevent distress and neglect when a member fails to attend through illness.

Miscellaneous services—Other activities of the voluntary organisations in relation to the domiciliary care of old people include a bathing service, the arranging of Christmas parties, seaside holidays and coach outings, a men's hairdressing service, occupational therapy, and an ostensibly small but much appreciated service—the sending of cards to the old people at Christmas time and on their birthdays. I gladly take this opportunity to pay tribute to the volume and worth of the voluntary contribution to the welfare services. The voluntary services are a vitally important element in the scheme of domiciliary care and there is great need of expansion to cover areas not yet provided for.

PART II.—THE RESIDENTIAL SERVICE

Responsibilities of hospital and welfare authorities—The residential service provided by the welfare authority is for those persons, including the aged and the infirm, who need care and attention which is not otherwise available to them. Sick persons needing treatment in hospital or mental hospital are the responsibility of the hospital authority. The distinction between the sick and the infirm is not always easily made; by way of guidance the Minister of Health broadly defined the two classes in this way:—

Sick—Patients requiring continued medical treatment or supervision and nursing care. This would include very old people who though not suffering from any particular disease are confined to bed on account of extreme weakness.

Infirm—Persons who are normally able to get up and who could attend meals either in the dining-room or a nearby day-room. This class would include those who need a certain amount of help from the staff in dressing, toilet, or in moving from room to room and also those who, from time to time, *e.g.*, in bad weather, may need a few days in bed.

More recently the Ministry expressed the view that responsibility should remain with the welfare authority for those elderly people in a welfare home who have to take to bed and are not expected to [illegible]

in the Ministry's view it is not the hospital authority's responsibility (in relation to people living either in their own homes or in a welfare home) to give all medical or nursing care needed, however minor the illness or however short the stay in bed, nor to admit all those who need nursing care because they are entering on the last stage of their lives. Hospital authorities have, however, been instructed by the Minister that if persons brought to hospital are found to need not medical treatment but simply care and attention, then they should not be refused admission while other appropriate accommodation is being found for them.

Cost of residential accommodation—Except for an Exchequer contribution which is normally payable towards the capital cost,

there has been a substantial increase both in the amount of accommodation provided and in the cost of running it.

Adapted and new properties—The great majority of the homes so far provided in this country consist of large old houses, purchased and adapted for the purpose. It is only comparatively recently that it has been possible to build specially designed homes. These naturally enjoy many advantages over the adapted properties, including especially a higher proportion of ground-floor bedrooms and single and double rooms. The location, setting, and external

, on the other hand, are usually

"special" Home.

mmodation—Residential accommodation at present in use is usually of two main kinds. Small

postulates a certain homogeneity of resident if the comfort, well-being, and freedom from embarrassment of the residents of each unit as a whole are to be assured. Larger establishments, usually

ied for

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homes may be for men or women only or for both sexes. Provision is made for the accommodation of married couples, but the demand for it is comparatively slight. Some of the homes are set apart and staffed and equipped for blind or partially sighted old people, and for the deaf-blind.

Governing principles: well-being and independence—The twin cardinal principles of the residential service may thus be stated:

out of their own resources; such amenities and services are provided as books, newspapers, and periodicals, opportunities for religious

worship, piano, radio, and, often, television. Dining-rooms are equipped with small tables seating four, and lounges and bedrooms are comfortably furnished. Fire prevention and precautions are closely studied, and safety devices such as extra handrails for stairs and corridors, free-standing baths, call-bell systems, and pilot lighting are installed wherever necessary and practicable.

Several features of the service are aimed at preserving or engendering a feeling of independence in the residents. The statute itself provides that they shall all pay for their accommodation, the amount varying with their resources but being in no case less than 26s. a week, and that out of their resources there shall be secured to them a sum of not less than 6s. 6d. a week for their personal requirements. Then they are encouraged to take some share in the smaller duties of their home, and those who render regular and valuable assistance in this way have their accommodation charges reduced. They choose their own clothing and provide it themselves if they have the means; they may be allowed to bring into the home some of their own furniture and to have their personal possessions about them. Wherever possible and appropriate they have single bedrooms or cubicles. Rules of residence are few, and the residents are free to come and go and have visitors as they please, within reason.

Occupation and recreation—At most welfare establishments efforts are made to interest the residents in various forms of handicraft, and where the results are sold it is usual to apply the profit to a residents' comfort fund. The primary object, however, is to engage the interest of the residents and occupy them in such creative activity as may be within their individual capabilities. Other forms of recreation commonly provided are film shows, concerts, coach outings, and visits to outside entertainments.

Health—The smaller homes are usually under the charge of a warden or a matron who may but need not be a state-registered nurse or a state-enrolled assistant nurse. Some of the larger establishments have both a superintendent and a matron. Every resident is entitled to nominate his own doctor, and sometimes, in addition, arrangements are made for a local practitioner to make one or more routine visits each week. The hygiene of the home, including such matters as heating, ventilation, sanitation, and nutrition, is generally supervised by the medical staff of the medical officer of health. Residents suffering from minor illnesses are nursed in the home; when they require prolonged nursing or the illness is acute, application for their admission to hospital is made by their own doctor or the visiting medical officer. When a resident is received into hospital his place is not filled until it is clear that he is not likely to return or that his absence will extend over a considerable period. In some areas the consultant physician in charge of a geriatric unit visits old people whose doctors have applied for their admission to hospital and advises whether out-patient treatment would be beneficial pending, or in lieu of, admission to hospital.

Exchanges are often arranged between a hospital and a welfare home where each has a patient requiring the services of the other.

Payment by residents—As has been said, the residential accommodation is for people who need care and attention which is not otherwise available to them. That is the sole criterion, so that the possession or lack of means is not material—unless, of course, the means are such as will enable the possessor otherwise to obtain the kind of care and attention which he needs. A standard charge has to be fixed by reference to the cost of providing the accommodation—usually between £4 and £5 a week—but what a resident pays depends on his income and assets, subject to a minimum contribution of 26s. a week. In assessing his ability to pay, the authority must assume that the resident will need 6s. 6d. a week for personal requirements. Thus, if all a resident has is a retirement pension of 32s. 6d. a week, he pays 26s. a week and keeps 6s. 6d. for his personal needs. If he has no means at all, the National Assistance Board will make him a grant enabling him to pay the minimum charge and have 6s. 6d. for his own needs. Certain kinds of income (*e.g.*, disability pensions and superannuation allowances) are protected up to a certain amount—that is, they are taken into account in fixing the contribution only if and in so far as they exceed the stipulated figure. If the resident holds unprotected capital amounting [illegible]

of his income.

Voluntary homes—Some 685 small homes with a total accommodation of 19,229 beds have now been provided by welfare authorities. There may be some doubt as to which local authority was the first to make this special provision for the old and infirm; it certainly existed in some areas well before the passing of the National Assistance Act, 1948. On the other hand, there can be no doubt whatsoever that the voluntary organisations were first in this particular field as they have been in so many others. A large number of "voluntary" homes were already in existence in 1948, and the total now stands at about 600, providing accommodation for about 18,000 old people. Under the Act of 1948 such homes must be registered with the local authority and may be inspected [illegible]

viding special accommodation and having special knowledge and experience in caring for, *inter alia*, old people who are blind, deaf

or dumb, crippled, epileptic, etc. Another useful kind of home which has been provided by at least one voluntary society is the "short-stay" home for old people whose relatives wish to go for a holiday or are temporarily unable for some other reason to have the care of them.

Intermediate homes—A notable development involving the voluntary organisations is the establishment during recent years of intermediate or rest homes, or half-way houses as they are sometimes called, for semi-invalids or the frail ambulant who waver between sickness and health or who, while not requiring continuous nursing or medical care, are yet in need of more care and attention than is normally available in a welfare home. They were first provided by the King Edward's Hospital Fund.* The National Corporation for the Care of Old People, which was established by the Nuffield Foundation in 1947, having "repeatedly called attention to the need for intermediate homes, between the hospital and the welfare home, equipped and staffed to admit and keep indefinitely, if necessary, the aged infirm who no longer require hospital treatment," themselves provided several rest homes and encouraged and assisted other voluntary organisations to follow their lead. It is an essential feature of the scheme that admission to the rest homes shall be only through a well-established geriatric unit of a hospital, which must guarantee to receive back any cases needing such nursing care as can be supplied only by a hospital. It is a further condition that the costs of maintaining individual residents, according to their medical condition, shall be borne by the hospital or the welfare authority. Not all of those received at these homes stay there indefinitely or return to hospital; some improve sufficiently to permit of their either returning to their own homes or being received into a welfare home.

Removal of persons needing care and attention—The National Assistance Act empowers local authorities in certain circumstances to secure the removal to hospital or other suitable premises (including welfare establishments) of persons needing care and attention which they are unable to give to themselves and are not receiving from other people. The persons concerned are those who are suffering from grave chronic disease or, being aged, infirm, or physically incapacitated, are living in insanitary conditions. The National Assistance (Amendment) Act, 1951, provided a more expeditious procedure in cases where the Medical Officer of Health and another medical practitioner certify that in their opinion it is necessary in the interests of the person concerned that he should be removed without delay. On an application by a county district council, a court of summary jurisdiction (or under the amending Act a single justice) may make an order for the removal of the person to a hospital or other place and for his detention and maintenance there for a period not exceeding three months (three weeks

* The first in England. The first in Britain was established by the National Corporation for the Care of Old People at Clydebank, Scotland, in 1948.

under the Amendment Act). It is scarcely conceivable that this power to remove should lightly be exercised or even resorted to at all save in the most extreme case and then only when every effort at persuasion has failed. It is usual for local medical officers to consult the welfare department in all cases in which removal to a welfare establishment may be indicated before initiating proceedings for an order.

Care of property of persons admitted to hospital, etc.—Where a person is admitted to a hospital or mental hospital or to welfare accommodation, the welfare authority is required to take reasonable steps to prevent or mitigate loss of or damage to his movable property if it appears that no other suitable arrangements have been made to that end. Where the person is admitted to a mental hospital or is otherwise unable to manage his own affairs, the welfare officer may be appointed Receiver of his estate if no relative acceptable to the Court of Protection can be found to undertake that responsibility. In other cases the department on being notified by the hospital authority or through any other agency is required to take steps to safeguard the person's movable property, *i.e.*, his furniture, personal effects, etc. Often this can be done simply by ensuring that the premises which contain the property are properly secured, and supervised by the local police. Loose cash, jewellery, or valuable securities are removed and despatched to the welfare department for safe custody. Where the person's absence is prolonged, other action may have to be taken unless some responsible relative can be found who is willing to take control of the person's affairs. It is often necessary to arrange for the storage of furniture and effects or, with the owner's consent, to arrange for its sale.

CONCLUSION

I believe that the residential service has a key-part to play in the care of old people but that in future it must be enabled to [illegible]

own homes, either independently or in their family circle but not in isolation.

SARGAISON, E. MIRIAM, Belfast. *The role of the hospital almoner.*

The almoner is concerned with elderly patients before their admission to hospital, during their time in the wards, and after discharge. On request from general practitioners for admission of elderly patients the almoner and the geriatric physician visit that patient at home in order to assess the need and to note the home conditions,

including the attitude of relatives or neighbours in caring for the old person. After the patient is admitted to hospital the almoner carries out a routine interview, and is able to consider the most suitable arrangements to be made after the patient's discharge. When this time arrives and the patient is returned home, or to other accommodation, the almoner follows up that case sometimes with the co-operation of the health visitor or a voluntary organisation, with the object of preventing a recurrence of the breakdown.

Belfast, a shipbuilding city and port, is peculiar in that it has a large number of elderly men who live in common lodging-houses,

Hospitals Trust).

SHAW, PATRICIA H. S., Nottingham. *The value of a special local authority medical appointment.*

Each of these health visitors said that she would like to take part in this work, and as a preliminary each health visitor made contact

that is needed.

Nottingham has a number of blocks of flats for aged people, and we have been appointing persons, who might be called wardens, who are responsible. Formerly these wardens worked rather in isolation, but there is now close co-operation between them and the health visitors concerned. Any offers we receive for voluntary work are put into the hands of health visitors who co-ordinate them. Some senior school girls have been anxious to help, and they are a great success.

COWAN, N. R., Rutherglen. *An advisory health clinic for old people.*

the National Health Service (Scotland) Act. The aims of the centre are: First, the provision of clinical facilities so that old people who are ostensibly healthy or suffering only from minor ailments can attend and receive a clinical assessment similar to that available in hospital, but in addition a medico-social assessment. Secondly, to promote the integration of all available services. The staff consists of myself, the medical officer of health, the consultant physician from the hospital, health visitors, welfare officers, and voluntary workers from the local old people's welfare committee. All persons are introduced by the general practitioner, and following the initial examination a letter is sent to the general practitioner. X-ray facilities are available and the chiropody services have proved to be of inestimable value.

MILNE, K. J. G., Sheffield. *The importance of the case conference.*

[illegible]

ment, and we were uncertain how the services of the two authorities could be linked.

[illegible]

a month. The ward sister informs us about the physical and mental condition of the patient in question, the almoner summarises the social background of the patient, and the health visitor gives us information on certain aspects of the home conditions. During the same meeting we discuss the problems of the public health department regarding those people who are at home, and we find this method of case work extremely valuable in maintaining an effective co-operation between the statutory services.

CHAPTER IV

NUTRITIONAL ASPECTS OF AGEING

McCAY, C. M., Cornell. *Bridging the gap between research and gerontological nutrition.*

STUDENTS of the history of medicine and science are aware that centuries of basic scientific knowledge must often accumulate before it can be of use. During such periods of growth in basic science, *faulty doctrines often rise and fall without much relation to* established facts.

Starting about four hundred years ago in the time of Vesalius, anatomy became a well-established science useful in diverse fields of surgery, physiology, and pathology. Starting a little over a century ago, in the days of Prout, Liebig, and Boussingault, the sciences of biochemistry and nutrition have made great progress. But much of our practices in nutrition must still rest upon long-established human experience because the basic knowledge is too fragmentary to permit application to man, especially during the latter half of the life span.

We still know much too little about important human factors in relation to such fields as genetics, climatic environment, mental conditions, exercise, endocrinology, flora of the gastro-intestinal tract, and a host of other important areas of knowledge.

One may well ask whether older people should be abandoned to

The problem of universal truths confronts us in the field of nutrition as it does in other areas of biology. Within the past quarter of a century we have come to realise that there are certain nutrients, such as riboflavin or pyridoxin, that represent essential vitamins throughout the whole gamut of life from bacteria to man. Other vitamins such as A seem essential for all vertebrates, but no insect has been discovered thus far that needs this fat-soluble vitamin in its diet. Thus, if one had established a science of nutrition based upon experiments on man or dogs and had applied this science to the lowly cockroach, the application would be quite correct in the case of many of the water-soluble vitamins but entirely wrong in regard to the fat-soluble ones.

Therefore one appreciates the limitations in application of a

people,
idividual
behind
existence

of a science of statistics, and this science is needed more and more as we pass into the later periods of life because the onset of chronic diseases introduces an ever expanding variability. Furthermore, the degree of body fatness may affect factors such as resistance to

stress, and this in turn may affect life-time nutrition and chronic disease.

In any nutrition study in which one follows the fate of short-lived animals, such as the white rat, from birth until death in old age, one is struck by the extremes of performance in withstanding the vicissitudes of old age. In our own laboratory we have moved this field of knowledge backward slightly by finding that certain rat mothers contribute offspring that are predestined to a short span of life, while a few others produce most of the progeny that are destined for a ripe old age.

This variability of white rats was well illustrated by one of the earlier studies in England under the guidance of the late Sir Jack Drummond. Many will recall this study in which two groups of rats were fed on similar diets in two different laboratories, but one group far outlived the other. Nutritional variables concerned with the B vitamins showed great differences in this study, but the two groups maintained in two different situations varied still more.

These observations of human experience and small-animal research both indicate that in applications of nutrition there must be wide generalisations that permit favourable application to populations, but that within these populations there must be factors that vary widely in favouring individuals. Thus, we have the food habits acquired when young, the amount of exercise taken daily by an individual, and the varying stresses that occur in the lives of individuals.

In considering the problem of the application of animal research to human nutrition it may be worth considering some specific problems. For more than a quarter of a century our own laboratory has used white rats for the study of the effects of obesity upon the diseases and nutrition of later life. The white rat is useful for such studies because its whole span of life covers only about two years. All evidence from such studies indicates that overweight shortens the span of life because it introduces early into the life span the chronic terminal diseases. Furthermore, all evidence indicates that steps taken to reduce overweight are useful, even when the animals have suffered from obesity for the first half of life.

In this case, animal experiments accord with human experience and the animal affords many opportunities for the study of this field in ways that cannot be used upon man. Only recently we have completed two types of study that illustrate such research. In the first, large groups of white rats were fed the following diets:—

1. Whole milk containing traces of copper, iodine, and manganese.
2. The same as No. 1, except that the milk contained 10 per cent. of sucrose dissolved in it.
3. The same as No. 1, except that a 10 per cent. solution of sucrose in water was fed separately from the milk.
4. The same as No. 1, except that the rats had continuous access to solid sucrose.

5. A mixed stock diet containing meat and many products commonly eaten by man.
6. A mixed stock diet similar to No. 5, but supplemented with 10 per cent. of its weight of cooked, dried, whole eggs.

Only a few of the results of this study will be stated briefly. In the first place, the results accorded with an earlier experiment completed several years ago in which rats fed these milk diets had denser bones and bones with a higher calcium content when they died in old age. This happened in spite of the higher level of dietary calcium in the stock diets.

Furthermore, females died at an older age and had denser bones than males. This sex difference in life span has been a common observation made in every laboratory using small animals and accords with human experience.

In the present study the rats of Group 2 fed the solution of sugar in milk became overweight in their youth and remained so until

Groups 3 and 4 suffered from the usual decay of the molars, indicating

Further-

than those

d accords reasonably well with human experience. However, from these data one can cite an example that has no human counterpart. In the case of the rats fed the supplement of egg, the males had a significant increase in life span in comparison with all other males.

span of life.

The problem then arises concerning the best method of intro-

in England some milk is consumed in tea by all age groups. In continental Europe the widespread use of coffee-milk drinks and cheese as dessert affords a modest milk allowance for the older people.

In spite of the huge surpluses of milk in America and attempts to dispose of these surpluses abroad or by putting them into the feed of animals, many older people feel they cannot afford to drink fresh milk. This is understandable when one appreciates that about two-thirds of those over 65 in America live close to poverty.

stress, and this in turn may affect life-time nutrition and chronic [illegible]

[illegible] follows the fate of short- [illegible] old age, one is [illegible] the vicissitudes of old age. In [illegible] this field of knowledge backward slightly by [illegible] rat mothers contribute offspring that are predestined to a short span of life, while a few others produce most of the progeny that are destined for a ripe old age.

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years with philosophy or sophistry that bread does not need to be good if people consume an adequate amount of fruit, vegetables, meat, milk, and eggs. The public and physicians have tended to go a step beyond this logic and have stated that if the diet is adequate one need not eat bread at all. Hence the consumption of bread has continued to decline slowly in the United States.

In addition the public has slowly lost confidence in bread as a food during the past few years due to the fact that they have not known what materials were going into it. In spite of limited news and due partly to national legislative hearings upon chemicals in foods, the public has become somewhat frightened by the list of chemicals put into bread mixtures in order to improve colour or mechanical handling.

In the eastern areas of the United States substantial volumes of animal feeds are sold that state on the label exactly the amounts of each ingredient used in the mixture, but until the modern improved bread programme was introduced no housewife knew the amounts of ingredients in the bread she was feeding her family.

American to gain a considered viewpoint from a work written on the other shore of the Atlantic, because nutrition writers in Great Britain seem less subject to pressures exerted by those seeking an outlet for the sale of synthetic vitamins in such products as flour than are comparable writers in America.

With this background it may be worth while to summarise some of the adventures of the past fifteen years in attempting to make better bread available for older people in the American market.

The first open-formula bread was placed on sale in Ithaca about 1941. This stated both the recipe and the amounts of ingredients or formula upon the label. Due to stringent war-time regulations this "open formula" bread was stopped in 1943 until the end of the conflict.

In 1946, as a result of observations made in the New York State mental hospitals, which care for more than thirty thousand older people, it was found that bread was probably the most important item in the diet. Therefore a decision was made to provide a bread that would have the highest possible nutritive value, good taste appeal, and modest cost. This led to the formulation of the bread that contained for each 100 lb. of unbleached white flour, 2 lb. of wheat germ, 6 lb. of full-fat soya flour, and 8 lb. of non-fat milk solids.

This bread exceeded expectations in regard to its pleasant taste

margarine or butter. Of course it has no vitamin C, but this vitamin may ultimately find its way into bread since it can serve as a conditioning agent in place of such compounds as nitrogen trichloride

or chlorine dioxide. However, I know nothing of the residual stability of ascorbic acid when it is so used.

The introduction of a product such as a bread of high nutritive value must follow two channels if the product is to find use in the diets of older people. The simpler of these is through institutions. Experience in New York State illustrates the methods and problems involved.

The first advance lay in the hands of an enlightened medical administrator who understood nutrition and its possibilities. Fortunately we had such a physician as director of mental hospitals. He ordered the new bread formula to be instituted in all hospitals. A field baker then went to each of the twenty-seven institutions and gave the bakers help and instructions for baking the new bread. Patients seemed to recognise no difference in taste or texture.

Some opposition to the new bread formula came from those who did the purchasing, because they had to buy some new ingredients. This never proved serious. The greatest stumbling blocks were often the wives of the psychiatrists. These wives had heard that bread was to be made by a new formula and occasionally tried to use their husbands, who were the administrators, to block the change. The improvements were made, nevertheless, due to continued pressure from the top administrator and his head dietitian.

Improving the bread for the old in the mental hospitals led to a better food for all patients and then into areas that had not been considered. In the first place, other general hospitals heard of developments in the mental institutions and started improving their own bread, especially if they had control of their bakeries. Such a change might seem less important in these hospitals because their food allowances are usually liberal in comparison with the food allotment of about fifty cents per person per day in State mental hospitals. However, there are probably always patients who depend heavily upon some food item such as bread for their nutrition. Therefore since the best in bread costs only about a half-cent per pound more than the worst, it seems logical to make products of high nutritive value whenever the cost is reasonable, even for general patients.

While the bread was being put into use in the mental hospitals the school lunch administrator and his nutrition advisers debated for a period of about a year the possibility of using the bread for the children's school lunches in our largest city, New York. Finally, they let contracts and put the bread into the lunch programme.

This development set a pattern for smaller cities and towns. Within a few years a rather widespread use of the bread developed throughout New York State in school lunch programmes. This in turn led to education of bakers in making the bread to satisfy the demands by the school lunch directors and home economics teachers of the schools. These are usually women with training in food preparation.

Many smaller bakers had to start making the new bread in order to keep their school lunch business. Soon these discovered that the bread had pleasing taste properties in spite of its high nutritive value.

During the past quarter of a century in many communities the smaller bakers had lost their bread business because they could not compete with the cheap bread from the mass production of large bakers. Hence part of these were pleased to turn toward a specialty bread that would give them new access to this market.

Some of the intermediate bakers soon entered this field also. But the largest national bakers fought the advances of high nutritive bread by increased advertising, "planted" magazine articles, and even by getting restrictive definitions of what constituted white bread adopted by the national food and drug administration.

To-day the improved bread can be bought at modest prices in most of the areas of New York State, but its production is spotty in the rest of the nation. The old people of New York State can afford to purchase their bread, whatever their income level. They do not have to do as one popular writer stated: "Get good bread in New York State by merely going insane."

As a result of these changes there is now a substantial interest throughout the milling and baking industries toward the genuine improvement of the nutritive value of baked goods.

Part of this is the result of increased public interest in the matter. One may ask what members of a community are liable to provide the leadership for the improvement of basic foods either in the interests of the old or the young. In New York State, with its population of about sixteen million, this leadership has been taken for the most part by women who have been trained in a field such as home economics. In the smaller communities such women will usually be found in the following positions: (1) home demonstration agents responsible for adult education; (2) home economics teachers in schools; (3) school lunch directors in schools; (4) home economists

the dairy organisations.

Usually such women and their better-food programmes are supported by the local dentists, the school physician, the public health nurses, and the school hygienists, who advise children upon teeth.

better bread in both large and small magazines. On the other *hand some of the largest magazines with large advertising accounts* carried articles opposed to the improving of bread, claiming either that such food improvement was a fad or that the improvement of

baked goods was non-essential if people would eat a good mixed diet of higher-priced foods.

Local food specialists on radio programmes often rendered their part in stimulating the bakers to make bread of higher nutritive value.

At first many bakers were frightened of their new bread because it had a [illegible] chalky-w[illegible] seemed s[illegible] Finally, the bread with the higher nutritive value seemed to be more satisfactory for the well-being of moulds as well as for man. Hence more care had to be used in wrapping when cool, storing for shorter times, and guarding the supplies in the stores. These were minor problems.

In conclusion one may note that all of these changes were made without funds and in opposition to a food industry that can devote millions to advertising and propaganda. Advances can be made in a democracy in improving basic foods even in the face of severe opposition, because we have reasonable freedom of the press and *have educated people, especially women, in our communities.* Finally, competitive industry will forward such programmes itself once it grasps the importance of better nutrition and the value of open-formula labels in creating an upward spiral in the nutritive value of foods such as bread.

The researcher may find life within the ivory tower more tranquil and less turbulent, but if he is to help "bridge the gap between his laboratory and the market place" he must labour with his contemporaries in many diverse settings.

SINCLAIR, H. M. *The dangers of overfeeding.*

"... and one of them is fat, and grows old."
—Shakespeare, "King Henry IV," II, iv, 146.

CONSIDERED in their relation to ageing, the dangers of overfeeding fall into two categories: there is evidence that overfeeding before maturity hastens this event and shortens life; there is evidence that overfeeding after maturity increases the incidence of certain degenerative diseases that are commoner in old age. The former problem I discussed at a recent Ciba Foundation symposium, and I shall therefore now only summarise briefly the evidence. The increased mortality amongst persons who are overweight is so familiar that I shall discuss mechanisms rather than mortality statistics; I have already discussed those briefly elsewhere (Sinclair, 1953).

1. **Over-nourishment as a cause of early maturation**—Possible criteria of the time of maturation in man are the attainment of maximum length, the menarche, or the ability to reproduce. The first is the most convenient. There is much evidence from lower

animals that retarding the growth rate increases the life span. Flourens (1855), modifying Buffon's data, believed that the time taken to reach full growth was in all animals a fifth of the life span; a dog should therefore live about ten years, a horse twenty-five years, and a man a century. Von Bunge (1903) noted that horses more commonly exceeded their span than did men. Man is unique in the proportion of life span used in reaching maturity; Brody (1945) showed that this proportion was constant for animals except man, [illegible]
puber [illegible]
decrea [illegible]
because there is a tendency to regard such heavy children as healthy and smaller children as under-nourished; they may look healthier early in life but die earlier: "I am resolved to grow fat, and look young till forty" (Dryden, "The Maiden Queen").

Much evidence has been produced to show that if lower animals are underfed while they are growing their subsequent life span or reproductive capacity is superior. Jackson (1937) showed the latter for male rats, Hansen and Steensberg (1950) for Danish cattle. That the life span is increased by slower growth was shown by Kellogg and Bell (1903) for silk worms, by Northrup (1917) for drosophila, and by Ingle (1933) for cladocera. Rudzinska (1952) showed that keeping a sessile protozoan, *Tokophrya infusionum* on a sparse diet prolonged life, and this was shortened by overfeeding. McCay's extensive studies on trout (McCay, Dilley, and Crowell, 1929) and rats (McCay, Sperling, and Barnes, 1943; Saxton, 1945; Saxton and Silberberg, 1947; McCay, 1952) have [illegible]
tumours, but these effects were obtained without influencing the growth rate. We have to decide what is the normal rate of growth for children and other animals. The concept of normality I have discussed at length elsewhere (Sinclair, 1948); by normal growth we mean neither maximum nor mean growth, and if we use the word "optimum" we must be careful to define its meaning. Unless it is shown that a slow rate of growth produced by limiting the diet impairs the performance of the animal's usual functions in its usual environment, we should probably regard this slow rate as being the normal rate if it causes a greater life span than does a higher or lower rate of growth. We should then be cautious about overfeeding children if we wish them longevity.

2. Over-nourishment in adults as a cause of death—It has been known for centuries that fat men die earlier: *Plures crapula quam gladius* (Gluttony kills more than does the sword). One of the Hippocratic aphorisms states that the more impure bodies are nourished the more they are harmed, another that repletion carried to extremes is dangerous; Pliny believed that many dishes bring

many diseases. Robert Burton was, as one might expect, more colourful: "As a lamp is choaked with a multitude of Oyl, or a little fire with overmuch wood quite extinguished; so is the natural heat with immoderate eating strangled in the body." Francis Bacon concluded: "It seems to be approved by experience, that a spare diet . . . rendereth a man long-lived."

These and many other ancient observations have been strengthened by the statistics of the Life Insurance Companies, particularly those of Dublin (Dublin and Marks, 1930; Dublin and Marks, 1951; Armstrong, Dublin, Wheatley, and Marks, 1951). An analysis has been made by Dublin of the mortality of persons insured as sub-standard risks because of overweight between 1925 and 1934 and traced to 1950. The numbers are large: amongst 25,998 men there were 3,713 deaths, and amongst 24,901 women 2,687 deaths. The mortality amongst overweights is high and increases with the degree of overweight: the death rate amongst the obese is relatively greatest amongst the younger men. The mortality ratio (death rates of men accepted for standard insurance being 100 per cent.) was 142 per cent. for men with moderate obesity and 179 per cent. for those with marked obesity: for overweight men in the 20-29 year age group at time of examination it was 180 per cent., 30-39 year 169 per cent., 40-49 year 152 per cent., and in the 50-64 year age group 131 per cent. The chances of dying of cancer of the lung if one smokes over twenty-five cigarettes daily are smaller than the mortality risk from being a stone overweight.

Presumably for mechanical reasons there is a greater incidence in the obese of degenerative arthritis in the knees, hips, and lumbar spine (Harmon, 1942; Danowski and Winkler, 1944; Moschcowitz, 1945; Faust, 1946), of fractures (Coombs, 1936), of varicose veins (Dublin, Fisk, and Kopf, 1925; Danowski and Winkler, 1944), of hernias (Heart Council of Greater Cincinnati, 1929-30), and of accidents (Dublin and Marks, 1951). For similar reasons postural changes occur (Kerr and Lagen, 1936) which produce emphysema and a diminished vital capacity (Short and Johnson, 1939).

The gestational complications of obesity are not entirely mechanical. Obese mothers have large babies with greater difficulty in obstetrical delivery (Matthews and Der Brucke, 1938; Odell and Mengert, 1945; Sheldon, 1949). But toxæmia is apparently commoner in obese women (Chesley, Somers, and Vann, 1948), and conversely the incidence may be less in under-nourished women (Smith, 1947).

The most important disorders that are commoner in the obese are, of course, degenerative cardiovascular and renal diseases, diabetes mellitus, cirrhosis of the liver, and cholelithiasis. The evidence has been so often and so well summarised (Dublin and Marks, 1951; Armstrong *et al.*, 1951; Rynearson and Gastineau, 1949) that I can omit it. Some salient points will briefly be mentioned. At every age and in both sexes there is a steady rise in

blood-pressure, both systolic and diastolic, with increase in body weight for unit height; further, sustained hyperpiesis develops in the obese at a rate two and a half times as great as in those of normal weight (Levy, White, Stroud, and Hillman, 1946). It is true that the sphygmomanometer tends to record pressures falsely high in the obese (Wolf and Bonsdorff, 1931; Ragan and Bordley, 1941), but despite this there is no doubt that they have relatively higher true pressures. The increased incidence of atherosclerosis in the obese is very striking; Wilens (1947), for instance, in 1,250 consecutive miscellaneous autopsies at the Bellevue Hospital found advanced atherosclerosis twice as frequently in obese as in under-nourished persons. Tolerance to glucose is frequently reduced in fat persons

Dunlop, 1949). What is the mechanism of these associations?

3. **Biochemical basis of atherosclerosis**—It is well known that a condition resembling *human arteriosclerosis can be produced in* lower animals by raising the plasma cholesterol level (Ignatowski, 1909; Anitschkow, 1914); this is not only true for herbivores (Dauber and Katz, 1942; Steiner, Kendall, and Bevans, 1949). The development of atherosclerosis in man is related to the level of cholesterol in serum (Davis, Stern, and Lesnick, 1937; Keys, 1951 *a*; Katz, 1952), and in general there is a steady increase of about 2 mg. per 100 ml. yearly in the mean serum cholesterol level of well-fed men from adult age to the mid-fifties (Keys, Fidanza, Scardi, and Bergami, 1952). The very important point has been established in [illegible] the serum cholesterol level and

tion between the concentrations in serum of cholesterol and of Gofman's lipoprotein molecules (Keys, 1951 *b*). Keys therefore suggests that increased dietary fat raises serum cholesterol, and the raised serum cholesterol produces atherosclerosis; since increased dietary fat will also tend to cause obesity, it is not surprising that *atherosclerosis is commoner* in obese persons.

There is much supporting evidence from clinical studies. Atherosclerosis is commoner in conditions in which serum cholesterol is raised, whether or not obesity is present: diabetes mellitus, nephrosis, myxœdema, xanthomatosis. In populations subjected to under-nourishment, which almost always involves greatly decreased dietary fat, atherosclerosis and its sequelæ are rarer (Aschoff, 1924; Malmros, 1950). But it appears that the ratio in serum of

phospholipid to cholesterol may be even more important than the absolute level of serum cholesterol. The serum cholesterol of rabbits can be considerably raised by surface-active agents without readily producing atherosclerosis, and the phospholipids rise to a great extent (Kellner, Correll, and Ladd, 1951). In this animal alloxan diabetes is accompanied by a marked rise in serum cholesterol without atherosclerosis, and again the phospholipids are increased (Duff and McMillan, 1951).

4. Biochemical changes in obesity—We have seen that there is a possible association between diabetes mellitus and atherosclerosis, and between obesity and atherosclerosis, since in each case there is a rise in serum cholesterol and this tends to be associated with atherosclerosis. But why should middle-aged diabetics be fat? Interesting work upon this problem is being done by Mayer at Harvard upon obese patients and hereditarily obese mice (Mayer, 1952). He has put forward the "glucostatic" hypothesis of appetite which supposes that appetite is conditioned not by the actual level of glucose in the blood but by the amount which can pass into and be used by cerebral cells in unit time. Appetite regulates the consumption of food so that this effective level of blood sugar is kept constant. In this strain of mice the inheritance of obesity is a Mendelian recessive; the adults weigh three to four times the normal, they become diabetic by the ninth or tenth week of life, and they die prematurely with very much enlarged islets of Langerhans. He believes the diabetes, which is relatively resistant to insulin and accompanied by raised serum cholesterol, is caused by over-secretion of glucagon from the α-cells of the islets of Langerhans with a secondary increased secretion of insulin which increases lipogenesis and causes overeating, the blood glucose is raised, but impaired phosphorylation prevents the effective blood glucose from increasing correspondingly.

We may speculate that an increased ratio of production of glucagon to that of insulin in the obese insulin-resistant diabetics causes initially an increased lipogenesis and increased appetite, particularly for fatty foods leading to obesity. The high-glucagon insulin-resistant diabetes that results will be accompanied by increased conversion of fatty acids to aceto-acetate and hence to cholesterol. Whether the increased activity of the α-cells as compared with the β-cells of the islets in these persons is primary or secondary t[illegible] production of growth hormone need not concern us; [illegible] primary and growth hormone is [illegible] might account [illegible] increase of glucagon sin[illegible] growth (Elrick, 1953). It is worth adding [illegible] diabetes so also in gross under-nourishment and in emaciating [illegible]ases there is an increase in the ratio of glucagon to insulin, and in under-nourishment eosinophilia has been noted in the anterior pituitary.

CONCLUSION

[illegible]

important and can be prevented there is no doubt. Dublin, in fact, has brought forward evidence in support of the view that fat people who lose weight live longer (Dublin, 1953). It is probable, from the work on lower animals that I have cited and from the fact that overfeeding probably hastens puberty (Bruch, 1941; Le Marquand, 1951), that the overfeeding of children is undesirable in that it causes early maturation and early death; overfeeding is certainly harmful in adults. We also know that excessive ingestion of certain nutrients, such as vitamin A, causes harm in a young growing animal (Wolbach, 1945) or in adult animals (Sherman and Trupp, 1949).

Recent biochemical work is beginning to shed some light upon the mechanisms involved.

DISCUSSION

Dr W. Stanley Hartroft (Toronto): "Under acute conditions (three days) of excessive caloric intake of a diet containing adequate lipotropic factors, previously under-nourished rats developed abnormally fatty livers. Controls consuming usual (non-excessive) amounts of the same diet did not develop fatty livers. These data suggest that under some conditions the usual protective effect of some essential dietary factors may be lost when the caloric intake is excessive. These results are in process of publication (Best, C. H., Hartroft, W. S., Lucas, C. C., and Ridout, J. H., 1954)."

Dr Groen (Holland): "In sixty normal human volunteers we have given different fatty diets, some containing vegetable food and some margarine. We found that one person might not react to a diet containing excess fat and very high cholestrol intake whereas others reacted sharply to this difference in the diet. Dr Key has [illegible]

condition is definitely inherited under the control of a specific gene. The fats are not overfed but in nature they are genetically abnormal."

Dr Sinclair, in answer to Dr Strong: "There is, of course, a very strong genetic factor. *That is particularly relevant to the work* of Mayer, at Harvard, where he is studying genetically this inherited obesity."

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WIDDOWSON, E. M., and McCANCE, R. A., Cambridge. *The response of well-nourished old men to starvation and of under-nourished old men to unlimited food.*

THERE are only too many obvious differences between age and youth. If there were not, none of us would have bothered to come here to-day. One of the signs of old age is a loss of functional elasticity—the inability to make a great effort if the situation calls for it. The metabolism and nutrition of elderly people have been investigated from time to time, but little has been done to find out the way in which old people respond to the stress of a sudden gross departure from their previous food intake. Within the past few [illegible]

other consisted of a study of the effects of giving a group of under-nourished old men unlimited amounts of food.

The first arose out of an investigation of newborn babies. We [illegible]

hunger œdema, for example—and we thought that one reason for this might be that when the intake of food was not sufficient to provide old men with the calories they require they might break down more body protein and less body fat than young men and that they might, in fact, contrast directly with infants in this respect.

Six young sailors aged 21 to 30 years and six healthy old men aged 74 to 84 years were the subjects of the first investigation. The young men lived and slept in one room at a comfortable temperature and the old men were in a hospital ward. They all spent their time lying or sitting and did not take any exercise during the test. Pre- [illegible]

twenty-four-hour periods and analysed for total nitrogen, and samples of blood were taken at the end of each twenty-four hours for the estimation of urea. Basal metabolic rates were measured before and during the experiment by the Douglas bag technique. The body protein which these men catabolised was calculated from the increase or decrease in the quantity of urea nitrogen in the body water and the total nitrogen excreted in the urine. Table I

TABLE I

BASAL METABOLIC RATES AND PROTEIN CATABOLISM OF STARVING YOUNG AND OLD MEN

	Average Age (Years).	Basal Metabolic Rates, K cal./kg./24 hr.	Protein Catabolised, Gm. N/kg /24 hr.	Ratio, K cal./N.
Young men	24	26	0·174	150
Old men	78	20	0·125	160

[illegible] tly lower basal [illegible] broke down a [illegible] ies to nitrogen [illegible] g at the results [illegible] to 20 per cent. [illegible] These figures [illegible] who had been [illegible]

stand up badly to under-nutrition and the reasons must be sought elsewhere.

The second investigation is one we made in Germany in 1946. At that time food was very short and everything was rationed. The official rations for a " normal consumer " provided 1,050 calories a

day when we arrived in Germany in June and had done so for the past three months. This was very little, particularly in view of the fact that the rations were rarely all available, and there is no doubt that the nutritional state of the population would have been very much worse than it actually was had it not been for the fact that very few people were living as "normal consumers." So many scales of supplementary rations existed that many people managed to qualify for one or other of them. Heavy workers, pregnant and lactating women, children, police, prison employees, firemen, tram drivers, and those who were employed by the occupying forces or the Control Commission are a few examples of those who were entitled to extra rations. Old people, however, seldom came into any of these categories, and the supplementary rations for which they most often applied were those issued for "hunger œdema." At the time when we reached Germany a system had been evolved whereby all patients certified by their doctors as suffering from "hunger œdema," whether at home or in hospital, were entitled to

[illegible]

helped them a great deal.

It was arranged with the Medical Officer of Wuppertal, where we were working, that all persons certified by their doctors as suffering [illegible] ations on this account [illegible] r Unit at the hospital [illegible] noticed that most of the people applying for supplementary rations belonged to the older age groups and that there were more men than women. A great many of them were genuinely very under-nourished. There were often obvious reasons for their failure to obtain enough food. They were too frail to stand in the queues to get the rationed foods, or they lived alone and depended upon some "Gasthof" for their meals—for which they had to give up their coupons—and they were unable to go out into the country to get food at farms "off the ration" as many of the younger people did.

After we had been working in Wuppertal for four months and were fairly clear as to what were the characteristics of the under-nourished individual as we were seeing him, we decided that the effects of giving a group of such old persons an adequate diet might well repay investigation. We accordingly chose six of the most under-nourished old men that we had seen in the out-patient clinic and invited them to take part in the experiment. Two of them were 80 years old. We also included in the investigation five under-nourished young men who had been prisoners of war in Russia and who had recently been repatriated; eight middle-aged men in their 50's also participated.

The men lived in the municipal hospital in Wuppertal-Barmen while the investigation was in progress. We were allowed the use of

three small wards as bedrooms and a larger room as a dining-room. The main experiment lasted for nine weeks. For the first week the men were given the ordinary hospital diet and during this time we made all the preliminary tests—clinical, biochemical, and radiological. For the next eight weeks the men were provided with unlimited calories in the form of bread, potatoes, margarine, sugar, cheese, tinned meat and fish, dried milk and cocoa; all that they ate was measured, but they were allowed to have as much as they liked at every meal. Weekly records were kept of their body weights, and at the end of the eight weeks all the investigations which had been made at the beginning were repeated. Arrangements were made with the local labour office that all of the men who wished should work in the hospital grounds clearing up rubble and levelling a large bank. They were not compelled to do this work, but they were paid for it and encouraged to do it. Whether it was the encouragement or the pay we do not know, but the oldest men worked the greatest number of hours and the youngest men the fewest.

When the experiment started the men had been short of food for the previous eighteen months or more. We were prepared for hearty appetites, but we got a real shock at breakfast on the first day. All the men ate an enormous meal and one of the 80-year-olds, Ewald, had the third-highest calorie intake of all the twenty men at this meal—3,170 calories. He ate 1½ lb. of bread, 2¾ oz. of margarine, 3 oz. cheese, and 3½ oz. of sugar, and suffered no ill-effects whatsoever.

Table II shows the average daily intakes of protein, fat, and carbohydrate and their total calorie value. It also shows the amounts *of the main foods eaten daily over the eight weeks of the experiment.* The old men did not eat quite so much food as the young ones, but they did not do badly at 5,600 calories a day for eight weeks on end!

TABLE II

AVERAGE INTAKES DURING THE EIGHT WEEKS OF UNLIMITED FOOD

	Young Men.	Old Men.
Calories per day	6,038	5,617
Protein, grams per day	198	190
Fat, grams per day	215	199
Carbohydrate, grams per day	851	791
Margarine, ounces per day	3·9	3·2
Sugar, ounces per day	5·8	4·9
Bread, ounces per day	20·6	19·8
Potatoes, ounces per day	25·0	21·0
Soup, pints per day	2·6	2·7

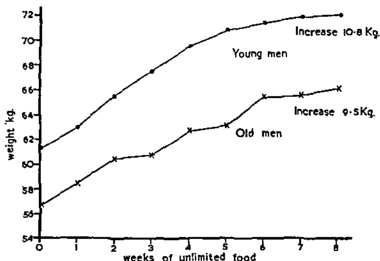

Average body weight during the eight weeks of unlimited food
72
70
68
66
64
62
60
58
56
54
weight kg.
Increase 10·8 Kg.
Young men
Increase 9·5Kg.
Old men
0
1
2
3
4
5
6
7
8
weeks of unlimited food

FIG. 1

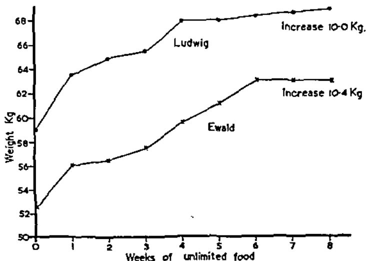

Weights of two 80-year old men during the eight weeks of unlimited food
68
66
64
62
60
58
56
54
52
50
Weight Kg
Increase 10·0 Kg.
Ludwig
Increase 10·4 Kg
Ewald
0
1
2
3
4
5
6
7
8
Weeks of unlimited food

FIG. 2

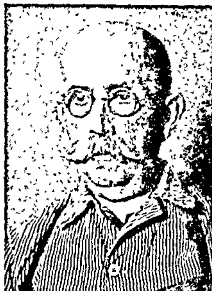
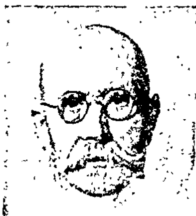



Fig. 3
Ewald at beginning and end of the experiment.




Fig. 4
Ludwig at beginning and end of the experiment.

At the beginning of the investigation all the men were considerably underweight, the young men on the average 16 per cent. below the [illegible]

but during the eight weeks they put on almost as much weight, and the same amount as a percentage of their starting weight.

Fig. 2 shows the weight curves for the two 80-year-old men, Ludwig and Ewald. They both gained 10 kg. and Figs. 3 and 4 show their appearance at the beginning and end.

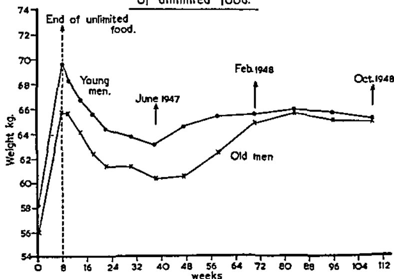


FIG. 5

[illegible]

been having for the previous eight weeks. They continued to come up to the hospital to see us, at first once a month and later every three months, and we were able to follow their progress for the next two years. The winter of 1946–47 was a severe one, and food was very short. The average body weight fell steeply until the beginning of March, and then more slowly till the end of June (Fig. 5), but at its lowest the weight of the young and of the old men was still 5 kg. higher than it had been when the experiment began. With the warmer weather and the improvements in rations

and in the supplies of vegetables, the weights began to rise again; the old men put on even more weight than the young ones, and in October 1948, when they paid us their last visit, the old men's weight was almost the same as it had been at the end of the experiment.

Some clinical observations on these men are worth putting on record. The pulse-rates were low on admission and rose as a result of the extra food (Table III); the young and old men reacted in

TABLE III

PULSE-RATES AND BLOOD-PRESSURES

	Pulse-rate (Beats per Minute).		Blood-pressure (mm. Hg).	
	Beginning.	End.	Beginning.	End.
Young men .	56	64	104/59	114/67
Old men . .	56	69	162/84	131/66

the same way. The results for blood-pressure were rather different. The young men had low readings at the outset, a common sign of under-nutrition (Brull, 1945; Lups and Francke, 1947; Keys, Brozek, Henschel, Mickelsen, and Taylor, 1950), and both systolic and diastolic pressures of all five of the men rose during the eight weeks of the experiment. The six old men had higher blood-pressures than [illegible] e end v [illegible] r this [illegible] d Holland (Lups and Francke, 1947) during the war found that, whatever the initial blood-pressure and whatever the age, the pressure fell as the person became under-nourished.

The average basal metabolic rates, expressed as calories per kg. per twenty-four hours, were the same for the young and the old men at the beginning, and there was no significant change for either

TABLE IV

BASAL METABOLIC RATES AT THE BEGINNING AND END OF THE PERIOD OF UNLIMITED FOOD

	Basal Metabolic Rates, K cal./kg./24 hr.	
	Beginning.	End.
Young men . .	22·2	22 6
Old men . . .	22·3	21·8

age group during the course of the experiment (Table IV). The values were intermediate between those for the young and old men, who were starving in the investigation earlier described. [illegible]

end of the experiment, and Table V shows the averaged results for the young and old men. In both groups the volumes were very high at the beginning; the normal value is [illegible] to [illegible] per cent. of the body weight. During the eight weeks of refeeding the absolute volume fell in spite of the fact that the average body weight had increased by about 10 kg.; there was a large fall when the volumes were expressed as a percentage of the body weight, but even at the end they had not reached the normal figure.

TABLE V

EXTRACELLULAR FLUID VOLUMES

	Volume Litres.		Extracellular Fluid as Percentage Body Weight.	
	Beginning.	End.	Beginning	End.
Young men	23·1	20 6	37 5	28·6
Old men	22 0	20 6	38 8	31 2

We could find little or no correlation between the volume of extracellular fluid and the amount of clinical œdema in the young or old men, either at the beginning or end of the investigation; in most cases the degree of œdema did not change during the eight weeks of extra food in spite of the decrease in volume of extracellular fluids. Once a person's tissues have been stretched by a collection of œdema they take a long time to recover their cohesive properties and the fluid in the legs which we call œdema accounts for only a very small fraction of the extra extracellular fluid that the under-nourished person is carrying about.

In both these investigations, therefore, old men have reacted quantitatively as well as qualitatively in the same way as young men. They still had sufficient elasticity of function to make exactly the same response, whether they were faced with starvation or a plethora of food. Should we be surprised, therefore, that so many of the other less exacting functions which have been investigated in healthy [illegible]

old he becomes.

DISCUSSION

Dr A. J. MESTER (London): "Did you investigate the serum proteins, especially in cases of œdema in old people?"

Dr WIDDOWSON: "We estimated the serum proteins at the beginning and the end in the old men. The values were slightly lower at the beginning (6 g. per cent.). At the end the values were 7 g. per cent. and no abnormal globulin ratio."

Dr S. HIRSCH (Brussels): "In the First World War we found, especially in women, an increase in osteomalacia. Did you

should."

Dr A. J. CARLSON (Chicago): "Was any specific quantitative study made of proteins rather than of calories?"

Dr WIDDOWSON: "In Germany we could not find any signs of any specific protein deficiency. There was calorie deficiency and protein was down in proportion to the calories."

Professor J. C. AUB (Boston): "Were the old people capable of storing protein; was the speed of storage of protein in the old as

were laying

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SCHULZE, W., Leipzig. *Protein metabolism and requirement in old age.*

SEVERAL reports have appeared relating to the protein requirements in old age, but there is no agreement as to whether these are diminished or increased. Kountz and co-workers, in extensive balance studies on four old men, concluded that 0·7 g. protein per kg. body weight was the daily requirement necessary to maintain nitrogen balance. They considered impairment of absorption, and other metabolic processes as a result of ageing, to be responsible for the protein depletion observed after a restricted protein intake. They therefore recommended a safety factor of 100 per cent. and postulated for an adequate protein intake an allowance up to 1·4 g. per kg. body weight daily.

In the present study, thirty-six hospitalised healthy volunteers between the ages of 60 and 92 were placed on a diet of high calorie value and rich in carbohydrates, and the protein metabolism was estimated after ten-day tests. During the first four days the daily nitrogen intake was limited to 4 g., and in the following six days only 0·5 g. of nitrogen was allowed. The total calorie intake was 50 calories per kg. body weight per day. Additional vitamins and minerals were also administered. The main nitrogen output during the final three days was calculated and related to body weight,

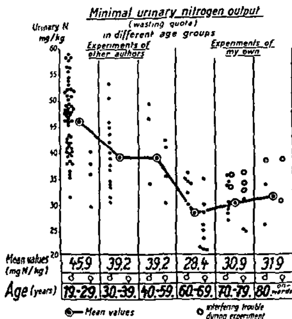


Fig. 1

surface area, and basal metabolic rate. The results were compared with seventy-nine studies in adults by other authors.

The dots in Fig. 1 represent the urinary output of nitrogen in milligrams per kilogram body weight. The mean values are joined [illegible] figures were slightly higher than the figures we obtained with old people.

TABLE I

WASTING QUOTA (ABSOLUTE *N*-MINIMUM) IN YOUNG ADULTS AND OLD SUBJECTS

(Mean values according to Hawley, Murlin, Nasset, and Szymanski, and of experiments of my own.†)*

Age in Years.	No. of Subjects.	Urinary N.			Urinary and Fæcal N.			Protein Calories Calculated of	
		Mg. per kg.	G. per m².	G. per Basal Calorie.	Mg. per kg.	G. per m².	G. per Basal Calorie.	Urinary *N* per Cent. of B.M.R.	Urinary and Fæcal *N* per Cent. of B.M.R.
22-30*	13	27·6	1·043	1·26	41·1	1·549	1·87	3·3	4·8
60-92†	28	29 0	1·059	1·24	37·6	1·401	1·65	3·1	4·4

* Mean values of the seventh (last) day of a "protein-free" diet period (0·2 g. *N* and 44·3 calories per kg. daily).

† Mean values of the fourth to sixth day of a "protein-free" diet (about 0·5 g. *N* and 50 calories per kg. daily) joining an "*N*-limited" pre-phase (3 to 4 g. *N* daily).

If the proportion of endogenous protein metabolism to the total basal metabolic rate is considered as a biological constant amounting to 4 to 5 per cent. of the latter, a steady decrease of the wear and tear quota in proportion to the diminution of heat production is to be expected in old age.

The percentage of protein calories calculated from the wasting [illegible] her [illegible] of [illegible] do- [illegible] the oxidation processes. Since the daily protein intake of ½ g. per kg. body weight is the minimal need of the healthy young adult, we conclude that it is insufficient to maintain nitrogen equilibrium in the aged.

In Kountz's patients there is a possibility that protein depletion occurred because of the relatively low calorie intake. In four healthy persons aged between 61 and 79, in balance studies lasting sixty days, we ensured a calorie intake of 3,000 to 3,300 calories daily. The diet was supplemented by dry milk powder in order to adjust the protein intake more efficiently. The animal proteins were thus raised in comparison to the vegetable proteins, in contrast to Kountz's diet.

At the onset 1 g. of protein per kg. body weight was allowed, but afterwards the daily protein intake was restricted to ½ g. per kg.

body weight for nine days. There followed six days when the protein intake was 0·7 g. per kg. body weight and, finally, the patients were put on the original diet of 1 g. per kg. body weight.

Fig. 2 illustrates the adaptation of the older patients to the restriction. It is conceivable that alteration in the biological and physiological values of the nutritional proteins might be responsible for the discrepancy between our results and those of Kountz. To test this point we carried out studies in eight elderly patients, estimating the comparative values of wheat and milk proteins. For the

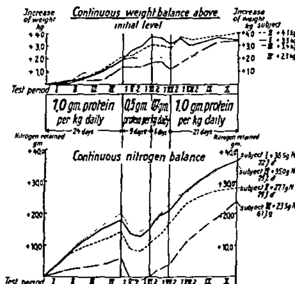
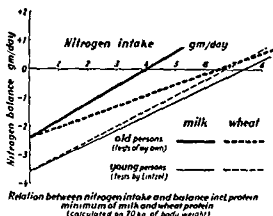


FIG 2

first ten days they were kept on a nitrogen-free diet and then placed for ten days on diet which was adequate in protein intake. The biological value and the physiological net utilisation of milk protein proved to be higher in the older rather than in the young patients (Table II, p. 126).

In Fig. 3 the abscissa represents the nitrogen intake and the ordinate the nitrogen balance. For the old and the young the relationship between average intake and balance on a "nitrogen-free" diet, as well as with additional protein feeding, is expressed by the different lines. The point of intersection of these lines and the ordinate represents the minimal nitrogen excretion, and the points of intersection between these lines and the abscissa the

minimal needs for nitrogen equilibrium; all are calculated on a



Relation between nitrogen intake and balance incl. protein minimum of milk and wheat protein (calculated on 70 kg of body weight)

FIG. 3

between the lines of both age groups represents the differences of net utilisation shown in Table II. The results are insufficient to permit of general conclusions, but they do not confirm the finding of Kountz.

TABLE II

NUTRITIVE VALUE OF MILK AND WHEAT PROTEIN IN YOUNG ADULTS AND OLD SUBJECTS

(*Results of Lintzel and of my own under the same conditions.*)

Protein Tested.	Age Group.	Number of Subjects.	Biological Value.	Real Digestibility.	Physiological Net Utilisation.	Protein Minimum, g. per 70 kg.
Milk .	Young	10	49·8	96·7	48·1	46·3
	Old	3	64·1	94·6	60·6	25·0
Wheat .	Young	8	57·8	92·4	52·9	42·2
	Old	4	40 5	86 9	35·2	41·0

Table III shows the utilisation of calories and proteins in the various diets and suggests that no important significance can be attached to intestinal absorption, the latter being equally good in the elderly as in the young.

We consider that the minimal nitrogen expenditure in the aged decreases in proportion to the diminution in the basal metabolic

rates. The minimal amount of protein required for nitrogen balance is equal to that in healthy young adults, namely, ½ g. per kg. body weight daily, provided the calorie intake is adequate. No

TABLE III

UTILISATION OF FOOD IN OLD-AGED (MEAN VALUES PER CENT.) IN COMPARISON WITH "PHYSIOLOGICAL STANDARDS" OF *YOUNGER ADULTS (IN BRACKETS)*

	Carbo-hydrate fat Diet.	Wheat Diet.	Milk Diet.	Mixed Diet Protein Limited.
Utilisation of food calories	97·1 (90-98·1)*	92·6 (92·9)†	92·9 (92·9)‡	95 2 * (87·38-97·4)
Utilisation of food nitrogen—				
(*a*) Apparent utilisation			·	80·7 (63-96)*
(*b*) "Real" utilisation:				
According to Mendel and Fine		85·1 (75·4-87·7)‡	92·5 (93·8)†	·
According to Lintzel and Rechenberger	·	86·9 (92·4)§	94·6 (96·7)§	··

* After K. Lang and O. F. Ranke.
† After v. Noorden and H. Salomon.
‡ After Rubner.
§ After W. Lintzel and J. Rechenberger.

impairment of intestinal absorption or in the biological values of proteins could be detected in the elderly.

We consider the protein need in the aged is diminished, but whether this represents the real requirements of the elderly cannot be finally [illegible] as habits [illegible] in order [illegible] is necessa[illegible] For all th[illegible] 1·5 g. pr[illegible] value of [illegible] person of 60 kg. body weight.

SHOCK, N. W., WATKIN, D. M., and YIENGST, M. J., Baltimore. *Metabolic aspects of ageing.*

Histological evidence shows clearly that, with increasing age, there is a gradual reduction in the number and size of functional cells with an increase in both amount and density of the interstitial substance in most tissues of the mammalian body (1). *It is thus* apparent that as living continues in a total animal some of the

cells are either unable to obtain necessary nutrients and eliminate accumulated metabolites or they lose their capacity for maintaining essential concentration gradients between the intracellular and extracellular phases. To the physiologist it seems axiomatic that functional changes in the cell must occur prior to its actual death and replacement by interstitial substance, as seen in histological sections. Thus far, however, evidence for such functional changes in cells is practically non-existent. [illegible]

intact organism. Obviously the latter measurements can give only crude values, but they offer a first step in an assessment of metabolic changes with age. It is obvious that two questions may be asked: (*a*) What are the effects of age on the total oxygen uptake of the intact organism? (*b*) What are the effects of age on the resting oxygen uptake of the individual cells remaining in the ageing organism? While an answer to the first question may have practical values, it is the second question which has important theoretical imp[illegible]

or [illegible] estimate of the number of functioning cells or the amount of parenchymal tissue remaining in the organism. In the past, physiologists have used either body weight or surface area as a method for correcting oxygen consumption values for the varying amounts of tissue present in different individuals. While this procedure has been useful in making corrections for different size subjects, it is obviously unable to distinguish between functioning cells and accumulations of interstitial tissue, fat, or water, which [illegible]

appreciably with increasing age (2), it is obvious that an estimate of intracellular water may provide a useful approximation of the amount of functioning protoplasm that is present in an organism. With the development of chemical methods for the estimation of total body water and extracellular fluid in the intact animal, it is possible to relate the total oxygen uptake of the animal to its intracellular water content. In the studies to be reported here, such estimates have been carried out on ageing humans (3, 4, 5).

EXPERIMENTAL

Tests were carried out on ninety-four ambulatory male subjects, aged 19 to 85 years. All were carefully selected from the wards of the Baltimore City Hospitals and the Infirmary Division (Old People's Home). Subjects with pathological states, such as œdema

or thyroid disease, that might influence fluid volumes or their distribution were excluded on the basis of clinical and laboratory examinations. All the subjects were maintained on a special ward under standardised conditions during the test period, and no patient was used who had not been in the hospital for a period of at least one month.

Simultaneous estimates of plasma volume, extracellular fluid space, and total body water were made under basal conditions except that a light, fat-free breakfast was permitted one hour prior to the beginning of the test. Following the removal of a control blood sample, an infusion containing 1 g. of antipyrine, 1 g. of thiocyanate ion, and 25 mg. of T-1824 dye in 50 ml. of physiological saline were infused over a period of five minutes. Additional bloods were drawn at a half, one, two, three, five, and seven hours after the beginning of the infusion. Plasma volume was estimated from the projection of the blood concentration of T-1824 dye, at zero time, as determined from a least-squares fit applied to a plot of the log

Bowler method (7) on samples drawn at one, two, three, five, and seven hours after injection, was used to calculate the extracellular fluid volume. Antipyrine determinations were made by the method of Soberman *et al.* (8) on plasma samples drawn at two, three, five, and seven hours after the injection. A similar least-squares fitted curve was used for estimation of total body water from those observations.

In a sub-sample of twenty-one subjects the above-mentioned

trial run on the previous afternoon in order to acquaint the subject with the procedure which included the attachment of the mask for the collection of expired air samples. Expired air samples were

rate, renal plasma flow, and the maximum rate of excretion of PAH were also determined on a different day. The renal function tests were made with the clearance technique, utilising the constant intravenous infusion of insulin and PAH (10). Clinical determinations of inulin (11) and PAH (12) were made on samples of arterial blood and catheterised urine specimens. The average of three twelve-minute test periods were used for the estimation of glomerular filtration rate, renal plasma flow, and T_m.

RESULTS

Age changes in basal oxygen consumption—When the basal oxygen consumption is expressed as calories of heat production per square metre per hour, there is a gradual reduction with increasing age. These results, plotted in Fig. 1, are in agreement with other studies in the literature. In Fig. 1 the values obtained in the study by Boothby, Berkson, and Dunn (13) are shown in solid black dots. As can be seen, these values are somewhat higher than those observed

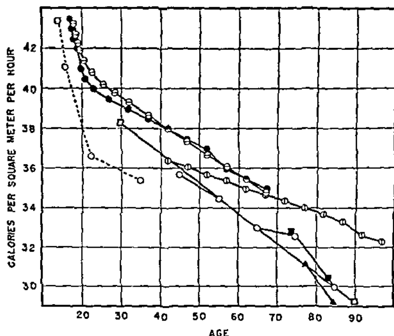


Fig. 1

Age changes in basal heat production, calories per square metre per hour.

ϴ———ϴ———ϴ Data from Boothby and Sandiford.

●———●———● Data from Boothby, Berkson, and Dunn.

□——————□ Data from Kountz, Chieffi, and Kirk (St Louis).

Φ———Φ———Φ Data from Lewis.

○———○———○ Data from Shock and Yiengst (Baltimore).

■———■———■ Data from Matson and Hitchcock.

▲——————▲ Data from Kisé and Ochi.

○- - - - - - - - - -○ Data from Shock (Berekeley, California).

by subsequent investigators. The most extensive series of observations on older subjects, collected by Lewis (14), is represented by the open circles with the vertical line. These subjects were white-collar workers who were still living in the community. Data from the present study are shown by the open circles connected with the solid line. It is interesting to note that these values are in close agreement with observations made by Kountz, Chieffi, and Kirk in a similar population studied in St Louis (shown by open squares) (15). The difference in the slopes of the age regression between the Lewis study and both the Baltimore and St Louis data lead to an interesting speculation as to whether this may be attributed to differences between an institutionalised and a non-institutionalised population. It is apparent from this figure that there is a significant reduction in basal heat production, expressed in calories per square metre per hour, with increasing age. However, this gradual reduction

to criticism. Table I summarises the source of error of these deter-

TABLE I

DAY-TO-DAY VARIATION IN FLUID VOLUMES (N=41)

	Mean Total Error.	Mean Error due to Technique.	Mean Error not due to Technique.
	Litres.	Litres.	Litres.
Antipyrine space	1·29	0·39	1·24
Thiocyanate space	0 30	0·16	0 27
Plasma volume (T-1824)	0 12	0 05	0 11

minations based on repeated observations in forty-one of the subjects
due
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age
changes in average values for total body water, extracellular fluid space, and plasma volume. Casual inspection of this table shows a gradual diminution in antipyrine space, with increasing age, with

TABLE II

AVERAGE VALUES FOR FLUID SPACES ACCORDING TO AGE

Age (Years)	N.	Total Body Water (Antipyrine).				Extracellular space (Thiocyanate).				Plasma Volume (T-1824).			
		Litres.		Litres per M².		Litres.		Litres per M².		Litres.		Litres per M²	
		Mn.	σ_{Mn}.	Mn.	σ_{Mn}.	Mn.	σ_{Mn}.	Mn.	σ_{Mn}.	Mn.	σ_{Mn}.	Mn.	σ_{Mn}.
19 to 39 .	8	34·5	1·94	20 00	0·79	16·5	0 96	9·54	0·39	2·98	0·18	1·72	0 07
40 to 49 .	15	34·6	1·58	19 62	0·48	17·0	0·84	9·68	0·37	3·10	0·15	1·76	0 06
50 to 59 .	16	33·1	1·52	19 34	0·63	16 8	0·69	9·85	0·29	3·15	0·12	1·84	0·06
60 to 69 .	22	31 9	0 87	18·47	0 37	16·3	0·40	9·42	0·13	3·00	0 09	1·73	0·05
70 to 79	17	30·2	1·27	18 17	0·37	16 1	0·72	9·62	0·24	2·91	0·15	1·74	0 06
80 to 89 .	16	29·7	1·03	18 08	0·38	16·2	0·76	9·79	0·34	2·98	0·20	1·82	0·11

TABLE III

VARIANCE RATIOS (*F*-RATIOS) AND REGRESSIONS OF FLUID SPACES WITH AGE

	F-Ratio.	Regression Coefficient.	S.E. Regression Coefficient.
		Litres per Year.	Litres.
Antipyrine space	2·54 S	−0·113	0·030
Thiocyanate space	0·35	−0·019	0·016
Plasma volume (T-1824)	0·40	−0·003	0 003
Intracellular space (AP-CNS)	4·83 S*	−0·094	0 018

S = Significant at 5 per cent. level. S* = Significant at 0·1 per cent. level.

significant age regression for antipyrine space and for intracellular space, but no change in thiocyanate space or plasma volume.

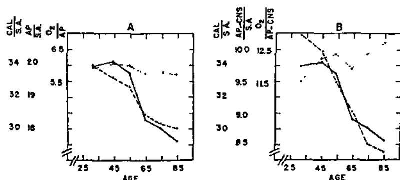


Fig. 2

Age changes in basal oxygen consumption per litre of total body water A and per litre of intracellular fluid B.

A ●———● *Basal heat production (calories per square metre per hour).*
●— — — —● Total body water (antipyrine space, litres per square metre).
●...............● Basal oxygen consumption (cubic centimetres per litre of antipyrine space).

B ●———● Basal heat production (calories per square metre per hour).
●— — — —● Intracellular fluid volume (litres per square metre).
●...............● Basal oxygen consumption (cubic centimetres per litre of intracellular fluid).

Fig. 2 summarises the results of the relationship between age and oxygen consumption when related to total body water A or intracellular fluid space B. In the left-hand plot A the solid black line shows the relationship between oxygen consumption, calculated as calories per unit of surface area, and age. The dash line shows the relationship between total body water, per unit of surface area, and age; whereas the dotted line shows the relationship between oxygen consumption, per litre of antipyrine space, and age. It may be readily observed that, although there is an age change in oxygen consumption and antipyrine space when calculated on the basis of surface area, there is no age trend in oxygen consumption per unit of antipyrine space. Similar results are shown in plot B, where a

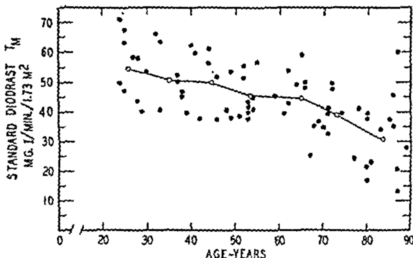


FIG. 3

Age changes in standard T_m diodrast. Data from Davies and Shock.

comparison is made between the intracellular fluid volume per unit of surface area and oxygen consumption per unit of intracellular fluid space. Here, again, there is no significant age regression when oxygen consumption is computed per unit of intracellular water.

Previous studies from our laboratory have shown a gradual reduction in renal function, per unit of surface area, with increasing age (10). Fig. 3 illustrates the nature and magnitude of this change in the maximum rate of transport of diodrast. Since this is a metabolic function of the renal tubule, it is possible to examine the question of whether observed age changes will disappear when this rate of transport is related to either total body water content or to oxygen consumption. In order to examine this question, all renal function values were calculated, per litre of antipyrine space, and per cubic centimetre of basal oxygen consumption determined in each of the seventy-one individuals tested. Table IV summarises

the results of a statistical analysis of the slope of the regression on age for each of the calculated values. As shown, there is a significant reduction with age in all renal functions when calculated either on the basis of antipyrine space or on the basis of oxygen consumption.

TABLE IV

SIGNIFICANCE OF SLOPE OF REGRESSION ON AGE FOR RENAL FUNCTIONS PER UNIT OF FLUID SPACES AND BASAL OXYGEN CONSUMPTION

(*Seventy-one subjects, age* 19 *to* 85 *years*)

Renal Measurement.	$\hat{b}$ Slope of Regression on Age.	S.E. $\hat{b}$.	t.	Significance Level p.
C_{IN} c.c. per min. per litre antipyrine space	−0·0315	0·0041	7·7	<0 001
C_{PAH} c.c. per min. per litre antipyrine space	−0·1904	0 0224	8·6	<0 001
T_m PAH mg. per min. per litre antipyrine space	−0·0229	0 0032	7 3	<0 001
C_{IN} c.c. per min. per c.c. basal O_2 consumption per min.	−0 0053	0·0007	7·5	<0 001
C_{PAH} c.c. per min. per c.c. basal O_2 consumption per min.	−0 0322	0·0039	...	...
T_m PAH mg. per min. per c.c. basal O_2 consumption per min.	−0 0039	0 0005	7·9	<0 001

This finding is in direct contrast to the results shown previously with respe[illegible] to total body water. It [illegible] renal function with age [illegible] ted for on the basis of cellular elements in the total body as represented by body water or oxygen uptake.

DISCUSSION

The results presented here lead to two interesting concepts. In the first place, it is apparent that a large proportion of the reduction in total basal oxygen uptake with age may well be attributed to the gradual loss of cellular elements. However, the studies on renal [illegible]

is obvious that some method must be devised to give a clear estimate of the number of functioning cells that are present in a tissue slice

or the number of cells of which the homogenate was derived. For instance, Rosenthal, Bowie, and Wagoner were able to show that the reduction in oxygen uptake of bovine articular cartilage with age was due chiefly to a reduction in the number of respiring cells (19, 20, 21). Studies on tissue slices tend to indicate a diminution in oxygen uptake of kidney and brain tissue but show little or no change in the respiration of liver slices or homogenates with increasing age. It is of more than passing interest that liver is one tissue of the body where parenchymal atrophy is not associated regularly with any considerable interstitial increase (1). Thus the observed reduction in oxygen uptake of kidney and brain tissue may turn out to be chiefly a reflection of the progressive loss of functioning cells.

SUMMARY

The interrelations between thiocyanate space, antipyrine space, basal oxygen consumption, inulin clearance, PAH clearance, and T_m PAH have been investigated in a series of ambulatory males aged 19 to 91 years. Analysis of these observations shows that although basal oxygen consumption per unit of surface area diminishes significantly with age, oxygen consumption per unit of total body water or per unit of intracellular fluid does not change significantly with age; *i.e.*, with increasing age there is a parallel decrease in total body water and oxygen uptake so that there is no age change in basal oxygen consumption per litre of total body water. On the other hand, calculation of renal functions per unit of total body water does not eliminate the age decrement in kidney function. It is therefore concluded that although a major part of the reduction in basal oxygen consumption with age may be explained on the basis of a loss of functioning cellular elements, certain tissues of the body may show alterations in metabolic rate with age which may not be entirely explained by loss of functioning cells.

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or the number of cells of which the homogenate was derived. For instance, Rosenthal, Bowie, and Wagoner were able to show that the reduction in oxygen uptake of bovine articular cartilage with age was due chiefly to a reduction in the number of respiring cells (19, 20, 21). Studies on tissue slices tend to indicate a diminution [illegible] uptake of kidney and brain tissue but show little or no [illegible]

body where parenchymal atrophy is not [illegible] [illegible] interstitial increase (1). Thus the observed [illegible]

SUMMARY

The interrelations between thiocyanate space, antipyrine space, basal oxygen consumption, inulin clearance, PAH clearance, and T_m PAH have been investigated in a series of ambulatory males aged 19 to 91 years. Analysis of these observations shows that although basal oxygen consumption per unit of surface area diminishes significantly with age, oxygen consumption per unit of total body water or per unit of intracellular fluid does not change significantly with age; *i.e.*, *with increasing age there is a parallel decrease in total body water and oxygen uptake so that there is no age change in basal oxygen consumption per litre of total body water.* On the other hand, calculation of renal functions per unit of total body water does not eliminate the age decrement in kidney function. It is therefore concluded that although a major part of the reduction in basal oxygen consumption with age may be explained on the basis of a loss of functioning cellular elements, certain tissues of the body may show alterations in metabolic rate with age which *may not be entirely explained by loss of functioning cells.*

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VERZÁR, F. *Compensatory hypertrophy of kidney and adrenal in the lifespan of rats.*

ADAPTATION to continually changing conditions is the most characteristic feature of life, and the loss of this capacity of adaptation is characteristic of ageing.

The decrease of elasticity of the tissues in the aged can be looked upon as a relatively simple *physical* form of loss of adaptation [illegible]

psychological field.

These three forms of adaptation which were studied in our laboratory are discussed elsewhere. At present we shall describe those *morphological* types of adaptation which can be observed in the form of *compensatory hypertrophy*.

It is well known that an increase of work of an organ leads to its hypertrophy. This is achieved either by an increase of the number of the cells or by an increase of their volume. Examples are the work-hypertrophy of the striated muscle, or the hypertrophy of the heart muscle if blood-pressure is increased as a result of greater resistance. In paired parenchymatous organs, such as the kidney and adrenal, this compensatory hypertrophy in consequence of increased function can be seen after extirpation of one kidney or one adrenal, or in the liver after extirpation of one lobe.

The compensatory hypertrophy of complex organs is not, of course, a simple process, since an increase in volume may be caused by increase of the specific functioning parenchyma as well as by an increase of interstitial tissues; or both may take part in the hypertrophy in equal or in a changed relation. There is a large literature on the morphological changes of different organs in the aged (Shock, 1951). In general there seems to be a decrease of parenchyma at the cost of the interstitial tissues. It has to be emphasised that [illegible] the aged are not the problem with which [illegible] organs [illegible] white rats. They were of a pure strain inbred for twenty-four years.

Since this paper forms an introduction to a series of papers on ageing in rats, it is necessary to give first a description of the life curve for our rat colony.

On 144 male animals from 1946 to 1950 the duration of life was controlled. Fig. 1 shows how many animals were living each month. The curve starts with the age of 7 months, since before this practically no spontaneous deaths occurred. However, it has [illegible]

This, of course, must lead to a certain selection which is neglected

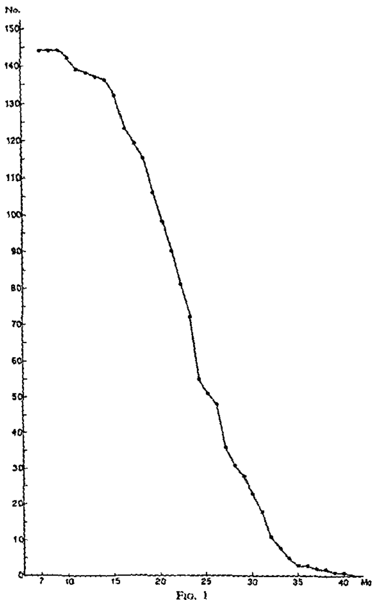


Fig. 1

Mortality curve of 144 male rats. The number of survivals is given month by month.

Ordinates: Number of animals.
Abscissa: Duration in months.

in this study. The curve shows that the dying starts at the age of 10 months, while the extreme maximum of longevity was found to be 41 months (1,230 days). The 50 per cent. life probability is [illegible] animals survived [illegible] months.

Our curve is very similar to that published by C. M. McCay *et al.* (1943). However, their animals seem to have a somewhat smaller life duration, since the 50 per cent. survival lay between 400 and 500 days.

It is impressive that the individual differences of life duration are so great, even in an inbred colony. The pathological assay showed at death mainly bronchopneumonia, the same finding as in the work of Slonaker (1928) and mainly by Saxton, Barnes, and Sperling (1946, 1953). The latter authors described this as a chronic bronchopneumonia with bronchiectasis. A certain number of animals die with tumours and some with suppuration of the middle ear.

In the years 1946 to 1950 no epidemic infection occurred, but it might be mentioned that in the winter of 1953-54 an epidemic of bronchopneumonia broke out in a neighbouring laboratory. It entered our stables, and of 167 animals which were 17 to 26 months old, fifty died in one week. There was not one case in 450 younger animals in the same stable. A few days before in the neighbouring laboratory, which was one floor below ours, obviously the same epidemic killed forty-two of 100 animals, all of which were fed without vitamin A. They received only 1·2 to 1·5 i.u. of vitamin A per day. A large number of other differently fed young rats remained healthy. The epidemic lasted there from 2nd to 12th March 1954 and in our laboratory from 4th to 16th March 1954.

The pathological-anatomical assay showed a bronchopneumonia with cheesy patches. The bacteriological survey remained negative. For this information we wish to thank Professor Dr K. Bernhard, and Professor Dr J. Tomcsik for the bacteriological, and Professor Dr F. Roulet for the pathological-anatomical assay. It was supposed that we were dealing with a virus pneumonia. Obviously immunity developed, since after three weeks this epidemic ended. The decreased resistance of ageing animals is clearly shown. It is of special interest that the same infection in the other laboratory killed only those animals whose resistance was diminished by lack of vitamin A.

While an infection can change the mortality curve, we found that a change in the diet from the stock diet to a protein-rich diet had no influence on the survival curves in the relatively small number of animals tested (Fig. 2, NZ, NE).

The diets were as follows: *Stock diet*—potatoes 1,050 g., mixture of different flours 260 g., meat 85 g., corn kernel 170 g., addition of yeast, salt mixture, iodinised NaCl, vitamin D, cod-liver

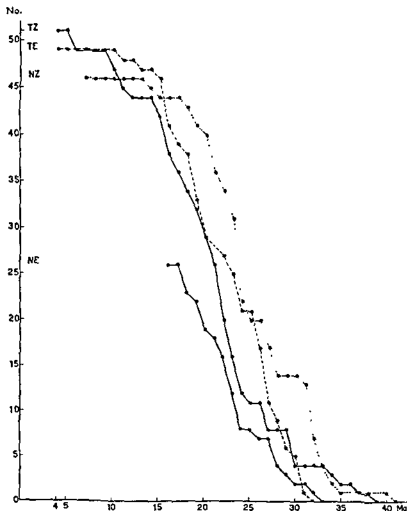


FIG. 2

Mortality curves. Four groups. Number of animals on ordinate.
Abscissa: Duration in months.

Group NZ: [illegible]
Group NE: [illegible]
Group TZ: [illegible]
Group TE: [illegible]

oil, carrots; *protein-rich diet*—meat 1,020 g., corn kernel 700 g., dried milk powder 300 g., oats 450 g., addition of iodinised NaCl, cod-liver oil, carrots, spinach, salad.

The *compensatory hypertrophy of the kidney* was studied in fifty animals of different ages. With these were compared sixty-eight

animals of equal age. Nephrectomy was performed under ether anæsthesia with a sterile operation on the left side from the lumbar region. The wound healed *per primam* in a few days. The first group consisted of fifteen males 1 month old. They were weaned

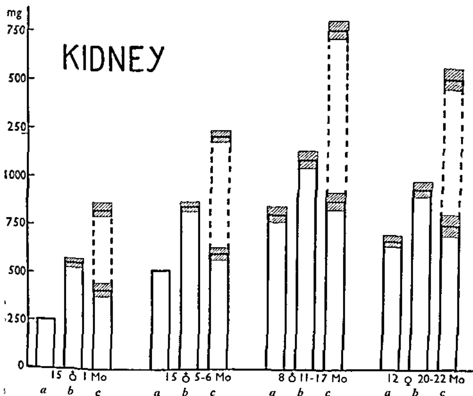


FIG. 3

Kidney weights. Squares give the medium weight in milligrams with standard deviation of

(a) Kidney before hypertrophy;

s the weight

from the mother five days before the operation. The second group contained *fifteen male animals 5 to 6 months old, and the third* group fourteen male animals 11 to 17 months old. The results are shown in Table I, together with the standard deviation of the average (mean) in Fig. 3.

Twelve old animals of 20 to 22 months were females. Their body and kidney weights are therefore lower than those of the males.

TABLE I

COMPENSATORY HYPERTROPHY OF KIDNEYS

Series.	Age at Nephrectomy (Months).	Number.	Number of Controls.	Sex.	Kidney Weight (Milligrams).				Hypertrophy Quotient Per Cent.	Body Weight of All.	
					Extirpated.	Hypertrophic after One Month.	Controls after One Month.			Start.	End.
							One.	Both.			
V and VI .	1	15	17	♂	256 6	553·7	396·7	793·7	140	70	95
VII and VIII .	5, 6	15	15	♂	520·3	849·7	608 0	1216 0	140	203	223
XIII and XIV .	11, 17	8	14	♂	814·6	1098·7	886·1	1772·1	124	318	342
XV and XVI .	20, 21, 22	12	22	♀	679·3	950·5	762 9	1525·7	125	253	251
Number of animals .		50	68								

All animals were killed thirty days after nephrectomy and the weight of the kidney assayed on an analytical balance. It was compared with the weight of the extirpated kidney. At the same time normal animals of equal age were killed, both kidneys weighed, and half of the latter value taken as a "normal kidney weight." The age given in the table is thus 1 month before the time of death.

$$Q = \frac{\text{Hypertrophic kidney}}{\text{Normal kidney}} \cdot 100.$$

This gives the hypertrophy as a percentage of normal weight. Such a calculation is necessary, since in young animals the kidney will grow during the experiment, also in the normal controls.

Table I shows that compensatory hypertrophy is 140 per cent. in the 1 month and the 5 to 6 months old animals. In 11 to 17 months old animals it decreased to 124 per cent., and in the 20 to 22 months old (actually at death 23 months old) animals it was also 125 per cent. The increase in weight of the newly formed material at different ages was:—

1 month	156·8 mg.
5 to 6 months	240·9 mg.
11 to 17 months	212·6 mg.
20 to 22 months	187·6 mg.

One might conclude that the capacity for compensatory hypertrophy, if the excretory work of the kidney is increased by 50 per cent., was still present in the old animals. It is, however, uncertain whether one can definitely say that it has decreased from 140 to 125 per cent. It seems probable that the newly formed material is the parenchymatous cells of the kidney, but the possibility cannot be excluded that a part of the increase may be interstitial tissue and blood-vessels. If in the old animals' kidney an involution was present, as has been stated by Araki (1925) and by Moore and Hellman (1930), who have shown that the number of glomeruli decreases between the 350th to 500th days of age by about 25 per cent., then two antagonistic processes were going on in these organs of which one decreased and the other increased the weight of the kidney.

The conclusion that in old animals the capacity of compensatory hypertrophy of the kidney decreases seems to agree with that of MacKay, MacKay and Addis (1924) (quoted by Oliver). They found that compensatory hypertrophy in 1 month old animals was 52·6 per cent. and in 1 year old animals only 32·3 per cent.

Compensatory hypertrophy of the adrenals was observed in fifty-two animals after extirpation of the left adrenal. The operation was made from the lumbar region under ether anæsthesia. As controls eighty-four animals of the same age and sex were taken.

TABLE II

COMPENSATORY HYPERTROPHY OF ADRENALS

Series.	Age of Adrenalectomy (Months).	Number.	Number of Controls.	Sex.	Adrenal Weight (Milligrams).				Hypertrophy Quotient Per Cent.	Body Weight of All.	
					Extirpated.	Hypertrophic after One Month.	Controls after One Month.			Start.	End.
							One.	Both.			
I, II, and XX .	1	24	45	♂ (5♀)	10·8	16·5	12·2	21·5	135	63	98
IV . . .	6·5	9	10	♂	19·9	23 0	15·5	30·9	148	217	229
XIII and XIV .	11, 17	7	7	♂	19 7	25·0	19·6	39·1	128	302	334
V and XXVI .	20, 21, 22	12	22	♀	27 3	36·9	30 8	61·5	120	273	248
Number of animals .		52	84								

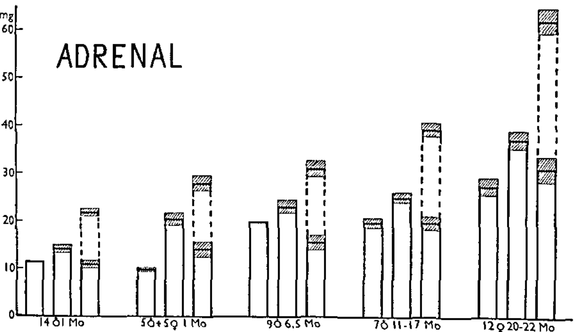


FIG. 4

Adrenal weights. Same as for Fig. 3. Mean weight in milligrams with standard deviation.

The 1 month old animals comprised nineteen males and five females. All other animals were males, save in the age group of 21 to 22 months when all were females. The latter explains why the body weights of this last group are smaller than the other. With age the adrenals increase in weight, especially in the old female. Since the weight of the two adrenals generally differs somewhat, we measured in the controls the weight of both and divided this as the value of one adrenal. One month after adrenalectomy the animals were killed and the weight of the second adrenal estimated simultaneously with those of the control animals.

Table II contains the results, and they are shown with the standard deviation of the mean in Fig. 4.

Hypertrophy was calculated as in the previous experiments:—

$$Q = \frac{\text{Hypertrophic adrenal}}{\text{Normal adrenal}} \cdot 100.$$

This value in 1 month old animals was 135 per cent., in 6½ months old rats 148 per cent., in 11 to 17 months old rats only 128 per cent., and in 20, 21, and 22 months old rats 120 per cent.

The actual gain in weight calculated from the mean values was:—

1 month	4·3 mg.
6½ months	7·5 mg.
11 to 17 months	5·4 mg.
20 to 22 months	6·1 mg.

Since the weight of both adrenals in the 20 to 22 months old [illegible] s old controls, [illegible] ls, in spite of [illegible] y different in these groups.

Thus these numbers show that the capacity for compensatory hypertrophy is still present in the old animals, but the hypertrophy is relatively smaller. The percentage shows similar values as with the kidneys.

[illegible] (1952) [illegible] on the adrena [illegible] He mention [illegible] here, has bee [illegible] 1950) state tha the weight of the adrenal cortex declines after the age of 50 in men. We therefore restrict ourselves to the conclusion that the capacity of compensatory hypertrophy exists in the old animals, although to a smaller percentage of normal weight.

DISCUSSION

In rats 20 to 22 months old, either one kidney or one adrenal was extirpated. After one month a compensatory hypertrophy of the second kidney had evolved. The value of this hypertrophy

for the kidney was 125 per cent., for the adrenals 120 per cent., compared with the weight of normal organs. In contrast to this, in young animals of 1 to 6½ months the hypertrophy of the kidney was 140 per cent. and that of the adrenals 136 and 148 per cent.

No facts are known about the role of the different tissues increasing in volume during the compensatory hypertrophy. It is therefore impossible to conclude from this study of weights that the parenchyma of kidney and adrenals has decreased in its capacity for compensatory hypertrophy. However, it seems to be very probable that this is the reason for the percentage decrease which was observed.

For the liver Bucher and Glinos (1950) found that in the ageing

Experiments in our laboratory on regeneration of liver in young and old animals are still unfinished but seem to show the same. Similar experiments on the hypertrophy of the heart muscle at increased blood-pressure are in progress

SUMMARY

1. On 144 white male rats, pure inbred, a survival curve was drawn. Spontaneous death occurs from the tenth month; 50 per cent. of the animals survived at 23 months, one died at 41 months.

2. This survival curve was not characteristically changed if the animals lived on a synthetic diet.

3. This survival curve was not changed if at the age of 8 to 10 days a thymectomy was performed. The thymus does not influence the age limit of rats.

4. The appearance of an epidemic of bronchopneumonia is described in which only old animals above 17 months died; while in another laboratory, where different feeding experiments were going on in young animals, only those with lack of vitamin A died.

5. The extirpation of one kidney in 1 to 6½ months old animals gave 140 per cent. compensatory hypertrophy.

6. Extirpation of one adrenal in animals up to 6½ months old gave 148 per cent., in 20 to 22 months old animals 120 per cent. compensatory hypertrophy.

7. In old animals the capacity of compensatory hypertrophy, after a 50 per cent. work increase, is still present but decreased in percentage in comparison to young rats.

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THUNG, P. J., Amsterdam. *Age changes in the mouse kidney.**

When recording body and kidney weights of pure-strain mice at different ages we find (Table I) that during young and adult life the kidneys grow along with the body in a fairly constant ratio. It is well known that the level of body as well as kidney weights is higher in male than in female animals. In old age, *i.e.*, at over 20 months, the kidneys show no decline in weight, while there is a distinct drop in the body weight in both sexes. This raises the question whether the kidneys at these old ages retain their original volume of active tissue. It has been concluded from chemical analyses that the rat kidney in old age loses cellular mass, while the content of water and extracellular substance increases (Lowry *et al.*, 1946).

In the nephron the proximal convoluted tubule plays a predominant part both in developmental growth and in function. In the mouse there exists an anatomical relationship between the tubule and the glomerulus, which is different from that in other mammals (Benda, 1887). The glomeruli of the mouse are relatively small compared to the tubules, their respective average diameters being about 75 and 25 μ. We seldom find the so-called "neck" or narrow junction between the glomerular space and the tubular lumen that occurs in human or even rat kidneys. Most mouse glomeruli can be said to lie in the relatively wide orifice of a convoluted tubule, and this enables the developing tubule to, as it were, grow around the glomerulus. As a result we may find tall epithelial cells lining the glomerular capsule, *i.e.*, lying along the parietal layer of the capsule of Bowman.

This occurs to a greater degree and in a larger number of glomeruli the more the tubular mass is developed. The Bowman's [illegible]

(1940, 1941), however, recognised it as a normal occurrence in untreated mice, as it is in male animals, and so constitutes a sex dimorphism. That the cells lining the glomerular capsules are not only morphologically but also functionally identical to tubular cells can be demonstrated by intravital staining with trypan blue.

* This work was supported by the "Gezondheidsorganisatie T.N.O."

croached upon the glomerular capsule, *i.e.*, for the development of the tubular mass, and more especially the mass of the proximal convoluted tubules. This value is found to increase during the development of the young kidney, the steepest rise occurring *between the fourth and the eighth weeks of life. In male animals* it reaches far higher levels than in females (Table I).

TABLE I

MOUSE STRAIN 020

	Females.			Males.		
Age.	Body Weight in Grams.	Kidney Weight in Milli-grams.	Per Cent. of Glomeruli with Tubular Cells lining the Capsule.	Body Weight in Grams.	Kidney Weight in Milli-grams.	Per Cent. of Glomeruli with Tubular Cells lining the Capsule.
11 days .	5·0	71	16	4·0	54	10
	5·0	69	12	4·5	56	20
3 weeks .	6·5	102	20	6 0	88	20
	.	.	. .	6 0	83	18
8 weeks .	19·0	225	33	23·5	333	65
	18·0	217	30	20·5	280	65
10 weeks .	.	.	.	23·5	325	59
	...	...	..	25·5	331	62
11 weeks .	19·5	211	24	...	...	...
12 weeks .	21·0	241	22	19 0	235	51
13 weeks .	19 0	215	30	24·5	290	61
	19·5	205	30	27 0	355	56
	...	...	..	22·0	286	52
	...	.	...	21·5	274	51
14 weeks .	18·5	201	28	24·5	307	69
	19 0	213	25	24 0	320	58
19 weeks .	21·0	260	30	...	.	...
	21·5	277	25	..	...	...
20 weeks .	...	...	.	26·0	340	71
21 weeks .	19·5	240	26	...	. .	...
	21·5	262	24	...	...	...
22 weeks .	...	...	...	25·5	334	61
10 months	26·0	309	15	27·0	366	79
	27·5	352	15	34·0	426	85
14 months	23·0	286	14	29·0	365	70
23 months	22·0	283	13	28·0	448	76
	22·5	283	13	27 0	391	85
	23·0	310	16	26·0	405	83
24 months	...	...	...	29·0	447	83

In male animals also there is no decline of these percentages in old age, while in the females, on the other hand, there seems to be a definite decline, which begins at about 10 months. From these observations we conclude that, though in female mice there may be some involution of tubular mass, in male mice the high kidney weights which are found up to extreme old age represent intact tubular tissue mass. Microscopically these kidneys are quite normal in all other respects.

In mice we may find severe kidney damage in old age. Dunn in 1944 described a disease which is characterised by widespread changes in the interstitial tissues, and which has characteristic effects in the kidneys of such mice. In various organs there appears a hyaline-like homogeneous substance which fills interstitial spaces normally occupied by fine collagenous or reticular fibres. This substance is also found in the spleen around the follicles, in the liver around the portal venules, and in the intestinal wall in the submucosa. It shows a certain resemblance to amyloid and reacts positively to several, but not to all, of the staining reactions for amyloid.

This same substance, with the same localisations, has been found by various authors working on the experimental induction of amyloid in mice. Experimentally its appearance has been induced by varied procedures, the most unique being the injection of sodium caseinate. In old mice, however, it has been proved to be a spontaneous process, a true degeneration of old age, the occurrence of which is genetically conditioned, as in some strains it is frequent while in others rare. Heston and Deringer (1948) studied the hereditary aspects of this condition.

In the kidney this " amyloid " degeneration may infiltrate the glomeruli, but it is always and predominantly localised in the renal papilla. Here the interstitial spaces between the papillary ducts become distended by swollen homogenous masses which cause compression of the orifices of these ducts and obstruction of the urinary flow. As a consequence of this obstruction we first see dilatation of the collecting tubules in the papilla and medulla. This dilatation soon ascends to the glomeruli, where the capsular spaces become blown up to cyst-like forms, while in the meantime atrophy and shedding of tubular epithelium sets in. The effect on the structure of the kidney is a loss of cortical mass by tubular atrophy, first in wedge-shaped areas which show up as pale grooves on the surface, and finally affecting the whole kidney. The cystically dilated glomerular capsules may cause translucent protrusions on the kidney surface. Microscopically infiltration with lymphocytes and plasma cells is a prominent secondary effect.

This kidney lesion, for which Dunn has proposed the name " papillonephritis," is a frequent cause of death in old mice. Unless this disease interferes with kidney function, old mice need not exhibit any deterioration or involution of the kidney on morphological investigation.

In connection with these anatomical facts, attention may be paid to one further aspect of renal function in mice. In the urine of healthy mice one always finds a high percentage of protein as a normal constituent. This physiological proteinuria is also found in rats and has been extensively investigated. In mice Parfentjev (1932) first noticed this protein excretion. Parfentjev and Perlzweig (1933) analysed the urinary protein and found it to be of a chondromucoid nature.

The concentration of this protein in the urine of mice increases during the process of renal growth in youth, and in male animals is higher than in female or castrate male mice (Wicks, 1941). We found that in both castrate male and female animals it could be raised by treatment with testosterone. All in all, it looks as if the protein concentration in the urine is proportional to the amount of tubular mass in the kidneys.

TABLE II

MOUSE STRAIN C_{57} BLACK

Age.	Percentage of Protein in Pooled Urine. Mean Values.	
	Females.	Males.
2½ weeks	3·9	4·3
3½ weeks	7·2	7·3
4½ weeks	8·2	4·0
5½ weeks	6·3	8·4
6½ weeks	7·9	7·5
7 weeks	9·9	14·4
8 weeks	8·1	19·9
4 to 6 months	6·4	13·4
7 to 9 months	6·8	15·3
10 to 12 months	5·6	12·5
18 months		14·1
19 months	4·3	10·6
20 months and older	1·6	2·7
	Percentage of Protein in Urine of Individual Mice of 20 Months and Older.	
	Females.	Males.
Without or with slight papillonephritis	6·4	16·0
	4·8	18·3
	3·5	9·0
	3·9	12·8
		10·4
	...	9·3
With heavy papillonephritis	0·5	1·6
	1·2	1·2

Protein determinations were done on the pooled urine of batches of usually eight mice to determine the influence of age. We used the biuret reaction as described by Gornall *et al* (1949). It appeared that, especially in male animals, there is an increase of the protein concentration in the urine during the period of tubular development, with again a steep rise just before the age of 8 weeks (Table II).

At older ages, however, the protein concentration seems to drop to lower values: above 19 or 20 months we found in both sexes nearly always distinctly lower percentages than in the urine of young adult mice.

For these protein determinations we used the strain C_{57} (black), because of its copious urine production. Old mice of this strain, however, are prone to develop the renal disease described above. The urine was individually collected from these old mice and afterwards the animals were autopsied. When the condition of the kidneys was studied it became discernible that these old animals could be roughly divided into two groups, those without or with only slight papillonephritic damage—and which generally retained high protein percentages in their urine—and those with a large degree of papillonephritis, which produced large quantities of dilute urine with a low protein content (Table II). The latter animals caused the protein concentration in pooled urine of old mice to be considerably lowered as compared with young adult animals.

Whether these differences in the protein concentrations in the urine of old mice are due only to variations in the capacity to concentrate the urine, or whether real differences in protein excretion are also involved, is, of course, not ascertained by these methods. Our findings do, however, confirm the conclusion that old mice until the end of their life span may retain completely intact kidneys, both morphologically and functionally. The fact that arteriosclerotic old-age processes are not seen spontaneously in mice does certainly bear upon this finding. In the amyloidotic papillonephritis, however, we have an old-age disease which is typical for mice and which may cause fatal degrees of renal destruction.

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COBB, W. M., Washington, D.C. *The age incidence of suture closure.*

A REPORT was made upon the age incidence in five-year groupings of absent, commencing, and advanced closure in nine vault sutures and thirteen facial sutures in 2,351 adult skulls of white and American negro stock. Record was made of 104 separate observations involving twenty-two sutures in each skull. The material was from the documental skeletal collections of Washington (St Louis) and Western Reserve (Cleveland) Universities. Data on cranial sutures amplify previous reports of others. Data on union of facial sutures was new. Union does not invariably occur in facial sutures and, *when it commences, tends not to go to completion. Variability is* great. Facial union occurs more frequently, tends to proceed further, and exhibits greater regularity in the male than in the female of both stocks.

TROTTER, MILDRED, St Louis. *Adjustment for ageing in stature estimates from long bones.*

THE chief problems in evolving reliable formulæ for estimation of stature from long bones are acquisition of data from the same individuals before and after death, provision for an unselected sample of the population, and determination of the amount of stature lost in ageing.

Opportunity to measure long bones of 1,200 individuals whose living statures were known arose with the repatriation of World War II deceased. The group represents a cross-section of young adult, native-born American white and negro males. Supplementary data of 855 older individuals of both sexes and of both races were obtained from the Terry Collection, which for this purpose is the best annotated in the United States.

[illegible]

decline of stature after 30 years of age, has been introduced. Substantial differences are present in the equations for whites and negroes and for males and females. However, with the adjustment for age, estimates of stature of different stocks were brought into closer accord with the actual values than has heretofore been possible.

BOH [illegible] *and* [illegible] *the*

[illegible]

SEVERAL macro-roentgenographical signs of the calcification (ossification) of different tissues, as seen in ageing persons, were discussed. The relation of this to the principal calcium depot in

the human skeleton was shown. The macro-roentgenographical signs of the hypertrophy in an ageing bone were demonstrated and discussed.

All these macro-roentgenographical signs have been studied also [illegible] author has not used any bone [illegible] of histo-roentgenography. The bone was cut either with the jig-saw or with a grinding machine. The sections of bone were placed on the fine-grain film or plate and were roentgenographed with very soft X-rays. The resulting histo-roentgenographs were studied under the microscope with a maximum power of × 600.

Histo-roentgenographical data on osteoporotic bone were demonstrated and discussed. It was emphasised that the bone resorption was seen in intra-ossal lacunæ (body cells) where osteoclasts were not present.

Hypertrophic bone in normal ageing persons presents microscopically a structure similar to that of normal bone. The same characteristics of hypertrophic bone were found in old dogs.

Micro-analysis of different calcifications and ossifications were given.

All the above-mentioned changes were found in "harmonic" old age of men and women. Some animals present the same radiographical picture. Therefore we consider them to be signs of the adaptation of the skeleton to the limited range of movements of the ageing body.

SULKIN, N. M., Winston-Salem. *The occurrence, distribution, and nature of PAS-positive substances in the nervous system of the senile dog.*

With a single exception in a study of twenty-two dogs over 12 years of age, three types of PAS-positive substances have been observed in the cytoplasm of nerve cells which differ markedly from each other in their physical characteristics and chemical properties. Histochemical studies which were described indicate that one of these [illegible]

in from zero to 15 per cent. of spinal ganglion cells in different dogs. It is also present in small numbers in the giant pyramidal cells of Betz, in ventral horn cells and [illegible] other neurons.

ANDREW, W., North Carolina. *Changes in mitochondria in various tissues with ageing of the organism.*

A NUMBER of tissues including exocrine and endocrine glands and portions of the central nervous system have been studied in relation to their mitochondrial content, both in regard to the numbers and arrangement of the mitochondria and to the morphological charac- [illegible]

the liver, and to some extent in the pancreas. It occurs more rarely in some of the other exocrine glands. Experimental studies which we have made show that such vesiculation can be induced in young animals, at least in the exocrine glands. The probable nature of the vesiculation and its effect upon the function of mitochondria were discussed briefly. Other changes, particularly in the form of mitochondria, were described. [illegible] from the short thick rod to [illegible] mandibular glands, and the [illegible] spheroid in the parotid glands. [illegible] system, particularly on the ce[illegible] in the ventral horn, were desc[illegible] and mice are being used in the study. In addition to the classical cytological methods demonstrating the mitochondria, electron microscopy is being employed, partly to demonstrate the changes in the mitochondria and partly to aid in the definite identification of these minute elements by means of their internal pattern.

WOOD, G. C., Leeds. *Some properties of the collagen component of elastic tissue and their change with age.*

[illegible] such as one finds in aortic media [illegible] ponents plays in the mechanical behaviour of the whole tissue. The present paper will consider the part played by the collagen fibres.

In contrast to the other components of elastic tissue, collagen exhibits a high modulus of elasticity and this protein has therefore been considered to dominate the elasticity of the whole tissue under

elasticity.
a circum-
by Roy,
1880). The steeply rising part of the curve at high extensions has been attributed to the extension of the collagen fibres.

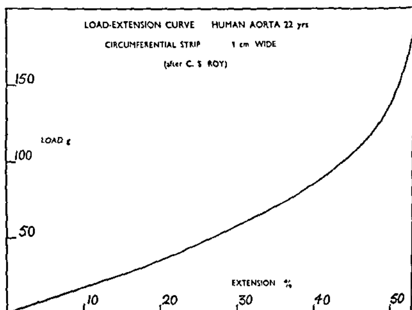


Fig. 1

The discovery by Banga and her co-workers of an enzyme or mixture of enzymes, present in hog pancreas, which they called elastase has put at our disposal a tool with which to elucidate the role of the collagen fibres; for, whilst preparations of elastase are capable of dissolving elastin, collagen is, apparently, not attacked under the same conditions. It seemed, therefore, that it might be possible to remove the elastin from elastic tissue and study the

is a much simpler
Sections 1 mm. by
the direction of the
g with N NaCl at

Fig. 2 shows a load-extension curve for such a strip from an animal of 6 to 7 years, the strip being immersed in water at 25° C. A similar strip was treated with 1 mg. elastase (fraction precipitated at 50 per cent. acetone concentration) in 10 ml. glycine buffer, pH 8·7, for sixteen hours at 37° C. and then washed with water. *The load-extension curve of this strip is shown in Fig. 3. It can be*

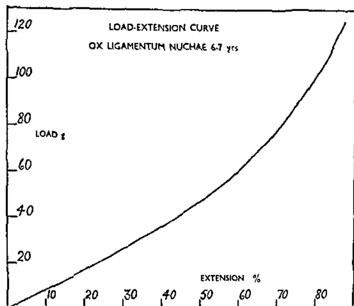

LOAD-EXTENSION CURVE
OX LIGAMENTUM NUCHAE 6-7 yrs
120
100
80
LOAD g
60
40
20
EXTENSION %
10
20
30
40
50
60
70
80

FIG. 2

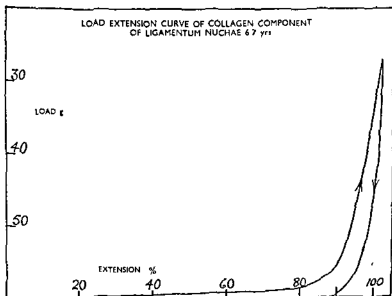

LOAD EXTENSION CURVE OF COLLAGEN COMPONENT
OF LIGAMENTUM NUCHAE 6 7 yrs
30
LOAD g
40
50
EXTENSION %
20
40
60
80
100

FIG. 3

seen that the tension rises steeply at about the same extension that the load-extension curve of the whole tissue starts to rise steeply. It can also be seen that when the strip was released it did not return to its original length but remained permanently extended at about 90 per cent. extension. This experiment thus confirms the observations of Remington *et al.* (1945), who obtained similar results by removing the elastin and muscle from human aorta by the less specific method of allowing the tissue to putrefy for twenty days.

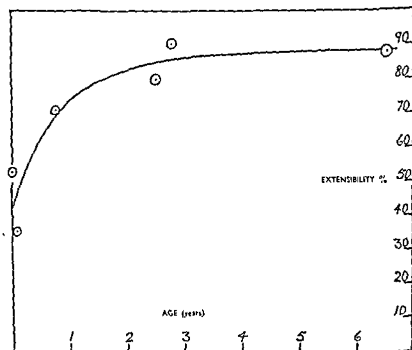


Fig. 4

The residue obtained by treatment of the tissue with elastase was examined further in order to confirm its collagenous nature. A two-dimensional paper chromatogram of a hydrolysate had a pattern which closely resembled that of authentic collagen. The residue showed marked shrinkage in water at about 62° C.—another characteristic property of collagen—and it also showed the same staining properties as collagen.

The next problem was to find out what happens to the collagen when it stretches irreversibly by 90 per cent. Dr Happey and his colleagues of Bradford Technical College have kindly examined samples of the material by the X-ray diffraction method and their preliminary results show that whereas the unstretched material gives a diffraction pattern characteristic of disorientated collagen,

the stretched material gives a pattern which closely resembles that of typical orientated collagen. The additional observation that both *the stretched and unstretched material* undergoes contraction in

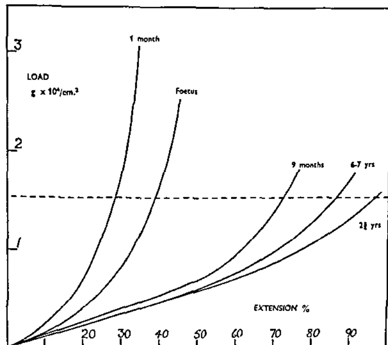


Fig. 5

Thus the collagen fibres appear to contribute little to the tensile properties of this elastic tissue at low extensions but are merely network in which they are embedded

varies with age, load-extension curves after treatment with elastase were determined for material varying in age from 0 to 7 years. The *results are summarised in Fig. 4, in which the permanent extension* expressed as percentage of original length is plotted against age.

Thus the extensibility increases markedly with age in the early stages of the animal's life. This phenomenon is mirrored in the behaviour of the whole tissue, as can be seen in Fig. 5, which shows load-extension curves. The order of extensibility of the collagen component is the same as the order in which the load-extension curves appear, and this point is brought out more clearly if one plots the collagen extensibility against the value of the extension at an arbitrary value of the tension such as that indicated by the dotted line. This has been done in Fig. 6.

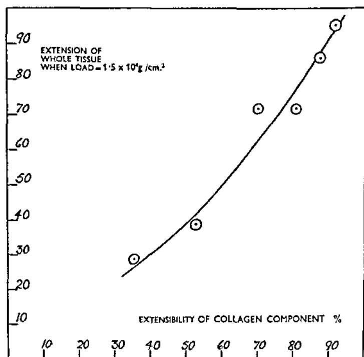


FIG. 6

[illegible]

found to be independent of age.

A simple explanation immediately springs to mind, however. Since the extensibility of the collagen in the ligamentum nuchæ of the newborn animal is low, the collagen fibres are probably fairly well oriented even in the unstretched tissue. As age increases, the distortion of the collagen increases, and it is suggested that this is

due to the repeated extensions to which the ligament is subjected in the early stages of the animal's life. I have tried to illustrate this process in Fig. 7. The oriented state of the collagen fibres in the young tissue is shown on the left. When the tissue is stretched the inextensible collagen fibres slip over one another, and when the tissue is released they curl up as shown on the right. This process must be accomplished only after many cycles of extension and retraction.

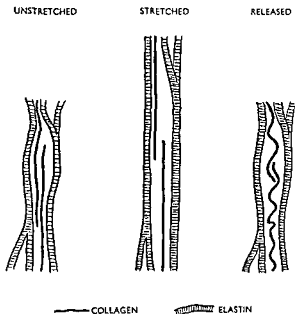


Fig. 7

Turning now to human aortic tissue, it may be noted that some workers have observed a similar increase in the extensibility with age in the range 0 to 20 years. Other workers have failed to confirm this, and the main change that has been found to take place is a decrease of extensibility with age up to 80 years. If any similar effect occurs in cattle ligamentum nuchæ, it must occur at ages greater than 7 years.

Determination of the extensibility of the collagen component of circumferential strips of human aortic media in the same manner

of ways. Firstly, tensile strength of the elastin component may

decay with age; this means that in the old tissue the collagen fibres are no longer constrained in a distorted configuration by a mass of highly elastic elastin fibres but are free once more to assume their fully extended state. The decay of the tensile strength of the elastin may be in its turn due to two factors. Firstly, the large number of loading and unloading cycles to which it is subjected might induce an elastic after-effect or creep which renders it permanently extended. Alternatively the elastin might be degraded by the elastase enzyme system. Another factor contributing to the decrease in the collagen

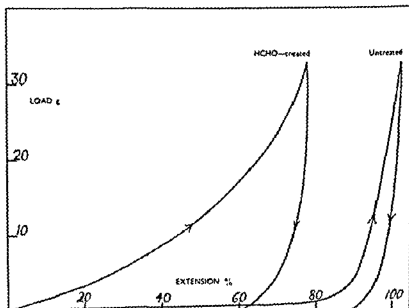


FIG. 8

extensibility might be the actual strengthening of the collagen fibres by chemical modification. A number of workers have suggested that the ageing of proteins is accompanied by the formation of cross-linkages between molecules, and it has been suggested that the small amount of aldehydes in the blood might be responsible for this. That aldehyde cross-linking might strengthen the collagen component of elastic tissue is indicated in Fig. 8, in which the load-extension curve of the collagen from a strip of ligamentum nuchæ is compared with the load-extension curve for a similar strip after it has been immersed for six hours in a 1 per cent. solution of formaldehyde.

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HALL, D. A., Leeds. *The mineral requirements of the elastase-elastin system.*

as being due to a decrease in the concentration of an elastase inhibitor which normally circulates in the serum. Subsequent estimations of the elastase content of the pancreas, in aged, arteriosclerotic, or diabetic subjects showed, however, that under these conditions there was a marked decrease in available enzyme. She therefore modified her hypothesis and suggested that elastase was involved not only in the degradation of elastin but also in its synthesis and that it was failure of the latter function which resulted in a decrease in the amount of elastin from hitherto elastic tissue. It seemed to us that this hypothesis merely begged the question, and in Leeds we have been examining other possibilities which might account for the fact

iful

the

fact that arteries in which arteriosclerotic lesions occur are those which become calcified on ageing. For instance, Lansing has confirmed

which

also m

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possible at this stage to determine whether degradation of elastin releases groups to which the calcium can become attached or if the very presence of the calcium activates the enzyme. Since, however, our interest lay mainly in ascertaining whether a stimulus such as this might in fact exist, we have given rather greater attention to the latter alternative.

Most of our experimental work has been carried out on ox ligamentum nuchæ, firstly because ox tissue is more easily obtainable in a mature non-senile state, and secondly because the ligament is a far more homogeneous material than aorta.

A first indication (Table I) that metal ions might play a decisive role in the elastase reaction came with the observation that at a given *p*H the activity of the enzyme was dependent on the composition of the buffer and was markedly depressed in buffers containing citrate. Although citrate has been shown to form complexes with a number of heavy and alkaline earth metals, reactions involving citrate inhibition in biological systems inevitably call to mind the

found to be even more potent an inhibitor of elastase than citrate. Its inhibitory action has been examined for a number of elastase

TABLE 1

EFFECT OF VARIOUS BUFFERS ON ELASTASE ACTIVITY AT *pH* 7·8

Buffer.	Activity Values.
Na Barbitone-HCl	23·2
Glycine-NaOH	20 0
Phosphate-citric acid	4·8
Phosphate	14 0
Borate-HCl	34·4

Activity values are arbitrary numbers directly proportional to the weight of soluble protein produced from 50 mg. of elastin after seventeen hours' incubation with 1 mg. of elastase in 10 ml. of buffer at 37° C.

fractions acting on a variety of substrates. Fig. 1 shows the results obtained when an elastase fraction precipitated with 20 per cent. acetone was allowed to act in the presence of EDTA on whole ox ligament, ox ligament which had been boiled with acetic acid to remove collagen, and a sample of this acid-treated material which in addition had been boiled with alkali for four hours.

Fig. 2 shows the effect of increasing the concentration of elastase on the inhibition produced by increasing concentrations of EDTA. From this it can be seen that increasing the concentration of elastase has no effect on the EDTA level at which total inhibition occurs. Inhibition is complete at inhibitor concentrations above a certain threshold value, but if the level is allowed to drop below this, the activity of the system increases with decreasing EDTA concentrations at rates dependent on the amount of enzyme present. A further family of curves (Fig. 3) obtained at a constant enzyme concentration, but at varying substrate concentrations, shows a markedly different effect. Since the activity in the absence of EDTA varies considerably with substrate concentration, the results are expressed as percentage inhibition, and here the level of EDTA at which maximum inhibition occurs differs with substrate concentration. From these two sets of results one can infer that the inhibitor attacks some active centre in the substrate and not in the enzyme. Such an active centre must almost certainly be metallic in nature, since EDTA is not known to form complexes with any other group of compounds. Further evidence in support of the presence of the EDTA blocked centre being an integral part of the enzyme-substrate system was obtained when attempts were made to reverse the inhibition by the addition of metal ions. No reversal was obtained on the addition of Mg, Mn, Cu, Fe^{++}, Fe^{+++}, or Zn, but significant effects were obtained with calcium. The series of curves shown in Fig. 4 indicate the percentage reversal of inhibition at varying citrate concentrations

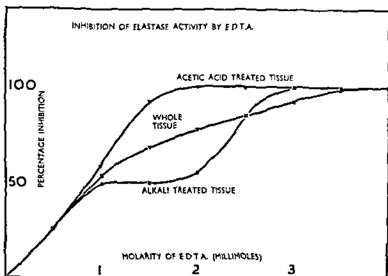

INHIBITION OF ELASTASE ACTIVITY BY E D T A
ACETIC ACID TREATED TISSUE
WHOLE TISSUE
ALKALI TREATED TISSUE
100
50
PERCENTAGE INHIBITION
MOLARITY OF E D T A (MILLIMOLES)
1
2
3

FIG. 1

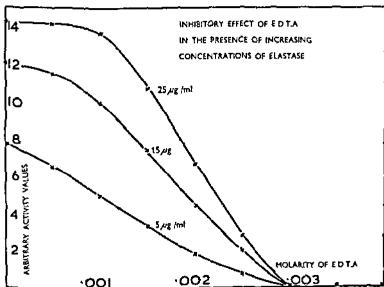

INHIBITORY EFFECT OF E D T A
IN THE PRESENCE OF INCREASING
CONCENTRATIONS OF ELASTASE
25 μg /ml
15 μg
5 μg /ml
14
12
10
8
6
4
2
ARBITRARY ACTIVITY VALUES
MOLARITY OF E D T A
·001
·002
·003

FIG. 2

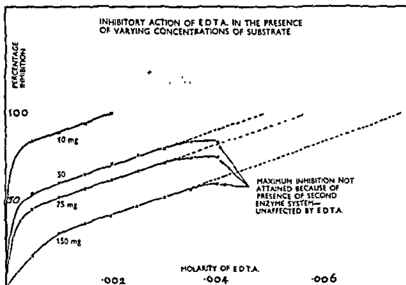

INHIBITORY ACTION OF E.D.T.A. IN THE PRESENCE OF VARYING CONCENTRATIONS OF SUBSTRATE
PERCENTAGE INHIBITION
100
10 mg
50
50
75 mg
150 mg
MAXIMUM INHIBITION NOT ATTAINED BECAUSE OF PRESENCE OF SECOND ENZYME SYSTEM— UNAFFECTED BY E.D.T.A.
MOLARITY OF E.D.T.A.
·002
·004
·006

FIG. 3

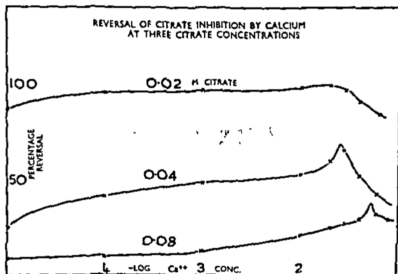
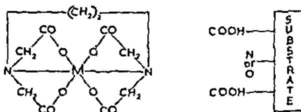

REVERSAL OF CITRATE INHIBITION BY CALCIUM AT THREE CITRATE CONCENTRATIONS
100
0·02 M CITRATE
PERCENTAGE REVERSAL
50
0·04
0·08
4 -LOG Ca++ 3 CONC. 2

FIG. 4

on the addition of increasing amounts of calcium. In the presence of small amounts of citrate the reversal is complete at relatively low calcium concentrations, but inhibition due to the presence of calcium ions themselves supervenes at higher concentrations. As the citrate level is raised, the amount of calcium required to cause optimum reversal also increases and the level at which inhibition occurs is also raised, giving a series of curves with decreasing maxima which move steadily towards higher calcium concentrations. A similar set of curves can be obtained with EDTA, although owing to the relative differences in stability constants between the two chelating agents their active concentrations differ considerably.

POSSIBLE MODES OF ACTION OF E.D.T.A. AS AN INHIBITOR OF THE ELASTASE / ELASTIN REACTION

1. Stripping metal from substrate.



2. Attaching to partially chelated metal in substrate.

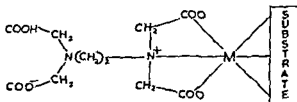


FIG. 5

We have evidence, therefore, that a metal is concerned in the reaction between elastase and elastin, and that this metal is either calcium or so similar to calcium, in charge, ionic radius, and general [illegible] replaced by calcium. There

[illegible]

concerned can strip it from the substrate, or, if they are unable to accomplish this, it may be possible for them to form mixed co-ordinated complexes, part of the co-ordination shell of the metal being satisfied from the substrate and part from the inhibitor. In either case the reversing effect of calcium is easily explained. If

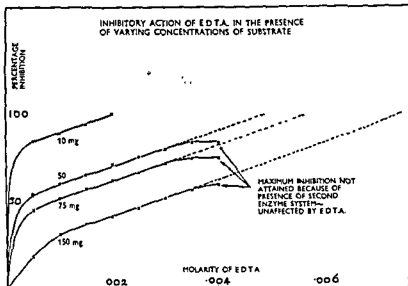

INHIBITORY ACTION OF E D T.A. IN THE PRESENCE
OF VARYING CONCENTRATIONS OF SUBSTRATE
PERCENTAGE INHIBITION
100
10 mg
50
50
75 mg
150 mg
MAXIMUM INHIBITION NOT
ATTAINED BECAUSE OF
PRESENCE OF SECOND
ENZYME SYSTEM—
UNAFFECTED BY E D T.A.
MOLARITY OF E D T A
002
·004
·006

FIG. 3

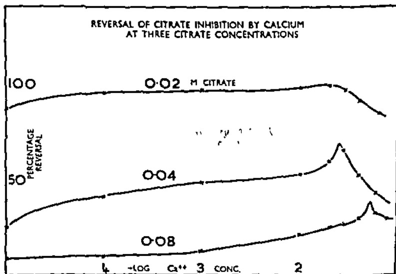
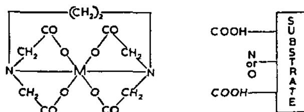

REVERSAL OF CITRATE INHIBITION BY CALCIUM
AT THREE CITRATE CONCENTRATIONS
100
0·02 M CITRATE
PERCENTAGE REVERSAL
50
0·04
0·08
4 -LOG Ca++ 3 CONC. 2

FIG. 4

on the addition of increasing amounts of calcium. In the presence of small amounts of citrate the reversal is complete at relatively low calcium concentrations, but inhibition due to the presence of calcium ions themselves supervenes at higher concentrations. As the citrate level is raised, the amount of calcium required to cause optimum reversal also increases and the level at which inhibition occurs is also raised, giving a series of curves with decreasing maxima which move steadily towards higher calcium concentrations. A similar set of curves can be obtained with EDTA, although owing to the relative differences in stability constants between the two chelating agents their active concentrations differ considerably.

POSSIBLE MODES OF ACTION OF E.D.T.A. AS AN INHIBITOR OF THE ELASTASE / ELASTIN REACTION

1. Stripping metal from substrate.



2. Attaching to partially chelated metal in substrate.

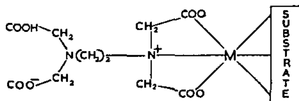


Fig. 5

We have evidence, therefore, that a metal is concerned in the reaction between elastase and elastin, and that this metal is either calcium or so similar to calcium, in charge, ionic radius, and general co-ordinating properties, that it can be replaced by calcium. There are two possible ways in which the various inhibitory effects which have been observed can occur (Fig. 5). Either the chelating inhibitors by virtue of higher stability constants with the metal concerned can strip it from the substrate, or, if they are unable to accomplish this, it may be possible for them to form mixed co-ordinated complexes, part of the co-ordination shell of the metal being satisfied from the substrate and part from the inhibitor. In either case the reversing effect of calcium is easily explained. If

the inhibitor is capable of removing the metal from the substrate,

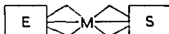
covering up the metal, then again it can be seen how calcium is capable of reversing the effect of the inhibitor; especially when this is EDTA. The stability constant of the EDTA calcium complex

ROLE OF METAL ION IN
ELASTASE / ELASTIN REACTION

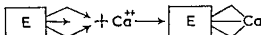
1 Initial state of reactant bodies.



2. Activated complex.



3. Effect of calcium.



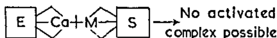


FIG. 6

is 30 per cent. greater than that of the inhibitor with any other metal of similar charge and size, hence by forming a more stable complex with the inhibitor calcium would be able to remove it from the metal

consideration of the role played by the metal in the actual enzyme

reaction, and the way in which calcium itself inhibits the enzyme. The active centre through which the enzyme and substrate react to form the activated complex contains the metal, attached to the substrate (Fig. 6). When calcium is added it reacts with the available *chelating groups in the enzyme and thus makes it impossible for* [illegible]

elastase-elastin complex being formed. Lansing, from calcium-phosphate ratios, has suggested that the calcium in calcified aorta is mainly present as calcium phosphate. The quantities which would be required to be in a bound non-inorganic form to satisfy the hypothesis which I have put forward would, however, be so small as to be undiscernible against the large amount of inorganic calcium present, and identification of calcium in the extract after EDTA treatment would not prove that it had come from the active centre.

Whether these observations will help us in our ultimate aim, the elucidation of the processes whereby there occurs a decrease in elastin content of aortic media after the onset of arteriosclerosis, remains to be seen. One can, however, make some rather engaging speculations. Banga suggested that elastase was concerned both in the anabolic and the catabolic reactions of elastin. One of these processes is associated with growth and tissue differentiation and the other with senility and disorganisation. It is too much to hope that in this one case at least we have evidence regarding the stimulus which changes the enzymic activity of the organism from that associated with growth to that connected with ageing.

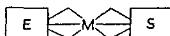
the inhibitor is capable of removing the metal from the substrate, this leaves chelating groups vacant for the acceptance of the calcium, which, as we have already noted, must be sufficiently closely related to the original metal to produce active material. If, on the other hand, the inhibitor blocks the active centre on the substrate by *covering up the metal*, then again it can be seen *how calcium is* capable of reversing the effect of the inhibitor; especially when this is EDTA. The stability constant of the EDTA calcium complex

ROLE OF METAL ION IN
ELASTASE/ELASTIN REACTION

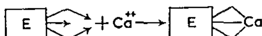
1. Initial state of reactant bodies.



2. Activated complex.



3. Effect of calcium.



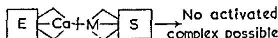


Fig. 6

[illegible] other metal [illegible]

which of the two possible modes of action is the correct one. However, it can be seen that if the metal concerned is calcium, then the [illegible] since the high [illegible]

consideration of the role played by the metal in the actual enzyme

AUB, J. C., and LOMBARD, H. L., Boston. *Cancer in old age.*

EVERYONE knows that the incidence of tumours increases with advancing years. Dr von Albertini (1) reported on this at the last International Congress of Gerontology, and the statistics of the Division of Cancer and Other Chronic Diseases of the Massachusetts

with carcinogenic factors, agents, or some other reason. It appears fairly clear that in man as well as in animals there is often a long latent period before a tumour becomes active in its growth. This latent period can be evaluated best in man in relation to tumours associated with carcinogens. Examples which may be mentioned

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rapidly growing.

The question that we want to dedicate ourselves to in this talk is, however, whether their so-called malignancy is affected by age. Do tumours in general increase or decrease in malignancy with advancing years ? It has been our impression for a long time that the tumours of old age grow less rapidly than those of youth. Is

stimulated to regenerate, then these regenerating cells from old

of younger animals.

CHAPTER VI

CANCER

AUB, J. C., and LOMBARD, H. L., Boston. *Cancer in old age.*

EVERYONE knows that the incidence of tumours increases with advancing years. Dr von Albertini (1) reported on this at the last [illegible]

to biologic changes in the ageing tissue making the host more susceptible, or whether it is due to an increased period of contact with carcinogenic factors, agents, or some other reason. It appears fairly clear that in man as well as in animals there is often a long latent period before a tumour becomes active in its growth. This latent period can be evaluated best in man in relation to tumours associated with carcinogens. Examples which may be mentioned [illegible]

advancing years. One might also guess that those which took the longest to manifest themselves might, by this very fact, be less rapidly growing.

The question that we want to dedicate ourselves to in this talk is, however, whether their so-called malignancy is affected by age. Do tumours in general increase or decrease in malignancy with advancing years ? It has been our impression for a long time that the tumours of old age grow less rapidly than those of youth. Is there evidence for this ? First, is there evidence in normal tissues ?

Bullough (2) had an interesting paper on mitotic activity in the ears of the aged mouse and showed that though normal mitosis is active during middle age, in senility it is reduced. In our opinion, if normal mitotic rates are lower it might be expected that neoplastic mitotic rates might also be lower. [illegible] n [illegible] d [illegible] n

of the liver in rats is about normal in the aged animal. In similar studies carried out with tissue culture, Glinos (4) found that growth of liver from old rats was very sluggish; but when the liver was stimulated to regenerate, then these regenerating cells from old animals divided as well as did those of younger animals. Hence it seems fair to assume that old cells, when put under strain, are still capable of active regeneration. Potential tissue growth is further [illegible]

of younger animals.

CHAPTER VI

CANCER

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of younger animals.

TABLE II

CORRECTED SURVIVAL RATES—TOTAL CANCER ALL SITES

Age Group.	Number.	One Year.	Two Years.	Three Years.	Four Years.	Five Years.	Ten Years.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Under 50 .	2,725	69·5±0 09	57·3±0 09	50 0±1 0	48·3±1·0	45·7±0 9	39 2±0·9
50 to 59 .	3,342	66·0±0 8	53·9±0 9	48·1±0 9	44 4±0·9	39 0±0 8	33·9±0 8
60 to 69 .	4,238	54·6±0·8	40·6±0·8	35·3±0 7	32·3±0·7	29·6±0·7	20·7±0·6
70 to 79 .	3,304	73·3±0·8	64·4±0·8	59·1±0 9	55·1±0 9	51·8±0 9	32·4±0·8
80 and over .	878	78·7±1·4	70·7±1·5	60·7±1·6	53·7±1·7	48·2±1·7	25·5±1·5

TABLE III

ALL CANCERS

Average Duration of Life

Age Group.	Death Within	
	Ten Years.	Five Years.
	Per cent.	Per cent.
Under 50	1·98	1·3
50 to 59	2·16	1·3
60 to 69	2·48	1·4
70 to 79	2·89	1·6
80 and over	2·74	1·8

How can this evidence be summarised ?

From the laboratory and the clinic the impression is gaining
diseases

If one takes into account the frailty of advancing years, it would be fair to expect that the aged would be more vulnerable to neoplasia. A metabolic drain such as neoplasm imposes on the host might be expected to produce death more rapidly in the aged than in the more resilient tissues of youth. But this does not appear to be the case. The other possibility, supported here by some evidence, is that tumours progress less rapidly in the aged.

If this is so, then therapy should be vigorous without too much concession to age. We suspect that our statistics would be even better had therapy not been restrained because of the patients' age.

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ALBERTINI, A. VON, Zurich. *Study of maturation of the epidermis epithelium in relation to ageing and cancer formation.*

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From the laboratory and the clinic the impression is gaining that aged tissues permit less rapid progression of neoplastic diseases than do tissues of the more vigorous ages.

Our statistics confirm this.

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into the matter with the aid of a more powerful tool, namely, the electron microscope. With such methods it is possible to visualise [illegible]

development of these systems takes place as a differentiation from the basal layers through the stratum spinosum up to the stratum [illegible]

[illegible]

which has been treated with methylcholanthrene. In the normal skin of the mouse the formation of the fibrils are sparse, but chemically treated skin shows extreme hyperplasia of the fibrils already in the basal-cell layer.

For the sake of comparison I made a similar observation in the mucosa of the cervix, and the results were analogous. The normal mucosa shows in the basal layer no fibril formation, and in the higher layers only [illegible] stratum corneum. [illegible] fication, or accordi[illegible] called abnormal epithelium as designated by the gynæcologist, [illegible] fibril systems [illegible] visible in [illegible] out what I [illegible] condition already a peculiar change can be noted, namely, in the lower layers no fibril formation takes place, they are only present in the upper layers; but in the lower layers the process of differentiation starts.

I would not like to draw conclusions and generalisations from the few cases I have had the opportunity to examine by electron microscopy, but I would like to draw your attention to one important poi[illegible] of [illegible] cha[illegible] mouse.

The cervix epithelium shows an analogous condition with its changed upper layers not unlike the senile keratosis, both suspected to be pre-cancerous, while the cervix starts with a process which is entirely opposite to the skin changes and cannot be called pre-cancerous in my opinion. Whereas in the skin I cannot decide [illegible]

BARNES, L. L., and McCAY, C. M., New York. *Bone tumours by radioactive calcium.*

In two experiments in which different groups of young rats were given relatively large doses of calcium^{45}, all of the rats which received the highest dosages developed bone tumours and died short of a normal life span. Those rats which received the lower dosages (much more calcium^{45} than is required for most studies on calcium metabolism) lived a normal life span and developed no bone tumours, so far as could be observed in X-ray pictures at the time of autopsy.

All rats were 30 days of age at the time the calcium^{45} feeding was started. Those receiving the largest amounts got an average total dose of about 5·6 microcuries of calcium^{45} per gram of body weight. The next highest total dose was about 1·2 microcuries per gram of body weight. With the exception of three rats, all were allowed to live out their life span, and full body X-ray pictures were taken at the time of autopsy.

The bone tumours which developed only in those rats on the highest levels of calcium^{45} apparently grew quite rapidly once they started. The full body X-ray pictures at the time of autopsy showed, in many cases, bone tumours of one or more of the long bones. In other cases tumours had grown on the spinal column and were

impossible.

A more detailed study of the pathology is being made on the preserved carcases of these rats.

ROGERS, J. B., and TAYLOR, R. C., Louisville. *The effect of age on the induction of sarcomas by methylcholanthrene in guinea-pigs.**

Guinea-pigs, of a strain in which the development of spontaneous tumours is a relatively common sign of senility, have been treated with methylcholanthrene. Age groups have been established as follows: young, 1 to 365 days; mature, 366 to 730 days; old, 731 to 1,095 days; senile, 1,096 days or more. Overgrowth of claws, sparsity of fur, degenerative changes in the kidneys, and cessation of reproduction characterise senility. Spontaneous tumours were found in 15·5 per cent. of senile animals of this strain at post-mortem. Only two spontaneous tumours have been found in animals dying in the first three years of life.

Guinea-pigs of the four age groups were treated with methylcholanthrene in sesame oil injected subcutaneously in the left

* Supported by a grant from the Division of Research Grants and Fellowships of the National Institutes of Health, U.S. Public Health Service, and by a grant to the University of Louisville from the Kentucky State Medical Research Commission.

subcostal region. One milligram of methylcholanthrene in 1 ml. *of sesame oil, repeated once after thirty days, was the smallest dosage* used. Ten milligrams of methylcholanthrene in 1 ml. of sesame oil, repeated twice at fifteen-day intervals, was the largest dosage used.

Seventy per cent. of young guinea-pigs treated with 10 mg. of methylcholanthrene repeated twice at fifteen-day intervals developed palpable sarcomas after 184 days (average).

Seventy-six per cent. of senile *guinea-pigs treated with 10 mg.* of methylcholanthrene repeated twice at fifteen-day intervals *developed palpable sarcomas after ninety days (average).*

Various types of sarcomas were found at post-mortem. In this experiment senile *animals* developed palpable tumours in less time than young, but these tumours grew more slowly and did not become as large as those in young animals. Young animals lived a shorter time after tumour induction than senile animals. Metastasis was more common in young than in senile animals.

STRONG, L. C., Springville. *Gerontologic studies of cancer in mice and men.**

THE present series of experiments dealing with an ageing process of the parents upon characteristics of malignancy in the offspring has lead to a series of publications (1 to 14). The data may be examined there. It is not the intention here to present new data but rather to point out some of the fundamental biological problems which may be indicated.

The investigation of this parental ageing process on malignancy may be divided into three parts, as follows: (1) The injection of methylcholanthrene *into a series of homozygous mice at 60 days of* age and to observe the ensuing neoplasms. The inbred strain used *(pBr) has been continued without selection by sibling matings for* more than forty generations. (2) A selection of offspring from the pair of mice *most resistant to chemically induced* tumours in each generation; and (3) a selection of offspring toward an early litter descent by continuing mice of only the first and second litters of each generation. The first selected experiment above (2), in addition to being a selection toward resistance to chemically induced tumours, is also a selection toward longevity, since it was found that the most resistant pair of mice in each generation lived the longest. In most cases, also, the selected mice were derived from a later litter descent. The third section of the investigation (3) is not only a selection toward an early litter descent, but is also an experiment in restricting the potential size of the family. In Sections 1 and 2 of the

* This experiment has been made possible, in part, by grants from Health Research, Inc., from The Anna Fuller Fund, and from The National Institutes *of Health, Public Health Service, U.S. Department of Health, Education, and* Welfare.

experiment, both parents in every generation were injected with methylcholanthrene dissolved in sesame oil at 60 days of age (1 mg. in 0·1 c.c. of sesame oil). In Section 3 the parents were not injected with methylcholanthrene. They were derived from mice of Section 1 in the F_{17} generation. Parents of mice in the third section have reached more than twenty generations of *inbreeding free of any injection of methylcholanthrene. That is,* between F_4—F_{17} of Section 1 both parents were injected with methylcholanthrene. Between F_{17}—F_{37} and beyond, used as parents for mice in Section 3, the parents were not treated with methylcholanthrene.

The data obtained in Sections 1 and 2 have been published in *Zeitschrift für Krebsforschung*, Bd. *58, S. 1-27 (1951). The paper* was written in collaboration with Dr L. D. Sanghvi of Bombay, India, and was entitled "Wirkungen der auslese auf chemisch erzeugte Tumoren bei Mäusen." A summary of conclusions of the data presented there is as follows:—

[illegible]

generations consisted of nine mice which were used for breeding purposes only. From the fourth generation onwards each one of the mice received, between 60 and 70 days of age, a subcutaneous [illegible]

counting all the tumours at a single site as one—were detected at various sites in 2,231 mice between the F_4—F_{20} generations. A total of 1,528 pathologic lesions were saved and studied for histology. As many as 561 mice died without any tumour being detected.

2. A statistical method is devised to study the multivariate effects of carcinogen and selection. The variables examined are the anatomical sites, histological types, sexes, latent period, and generations. The mice are divided into three periods of successive generations, consisting of 580 mice in F_4—F_{12}, 927 mice in F_{13}—F_{16}, and 1,285 mice in F_{17}—F_{20}. This procedure leaves adequate numbers of mice in the three periods to study the changes in the variables concerned. In F_{17}—F_{20} there were two families, one with 403 mice and the other with 283 mice, which had a common descent up to the eighth generation and separated thereafter. These two families were analysed for anatomical sites, litter seriation, and the latent period of local tumours. The method adopted for the entire analysis made possible the visualisation of the effect of carcinogen and selection on either the mouse or the anatomical site or the histological type of tumour in terms of probability.

... injection of carcinogen gave rise to tumours of a ... and at other sites. ..., fore stomach, ... ggests that the carcinogen has a wid...

There are considerable differences in the mean values of latent periods for tumours at different sites. The mean value is 201 days for the tumours at the site of injection, 447 days for surface tumours other than local or at the site of the injection of the carcinogen, 478 days for the tumours of the fore stomach, 510 days for lung ... for liver tumours. There are minor variations ... types at

... mean value ... bly there is very little or no effect of selection ... nt period of any specific type of tumour. These findings suggest that tissue susceptibility as reflected by its latent period shows considerable differences under the conditions of the present experiment. However, these differences are probably not subject to variations under the effect of selection.

... variations in the incidence of tumours at ... ical types during F_4-F_{20}. ... n the incidence of tumours ... ion in the tumour incidence ... veen F_4-F_{12} and $F_{13}-F_{16}$, ... 19·3 per cent. in the incidence ... histological types of local ... ch variation. The tumour ... variations both at different anatom... pes during F_4-F_{20}. The incidence of liver tumours also shows striking differences in the two sexes. This would suggest that tissue susceptibility could only be visualised i... expressed here as percentage incidence. ... of selection ... physiologic avenues. ... ceptibility in both the sexes during F_4-F_{20} the varia... tissue susceptibility, as measured by the proportion of mice that developed tumours at any site to all the mice, is not great. This would suggest that the control of this tissue susceptibility might be at a different level in the mechanism of heredity than total susceptibility.

4. A discussion is attached to our knowledge of the genetics of cancer in mice at three different levels, namely, the spontaneous tumour, the transplanted tumour, and the induced tumour. A probable interrelationship between them is suggested.

5. A discussion of the action of carcinogens is also included.

The fundamental principles involved in the induction of chemically induced tumours in Section 2—selection toward resistance to tumours—also apply to the observations recently obtained in Section 3. The chief difference between the data in the two sections is in the separation of the data according to litter seriation or the age of the parents at the time the young were born. Selection toward the descendants of first and second litter mice only continued to give rise to the dominant fibrosarcoma at the site of the injection for several generations. The latent period for the appearance of fibrosarcoma has been significantly lowered by this selection toward a first and second-litter descent: from $118 \pm 1{\cdot}16$ days in female mice to $98 \pm 1{\cdot}56$ days. This difference amounts to $20 \pm 1{\cdot}94$ days, which is $10{\cdot}3 \times$ P.E.[13] A new observation was found in that the survival time of mice bearing chemically induced fibrosarcomas has at the same time been significantly increased. This increase in survival time has been from $75{\cdot}8 \pm 2{\cdot}3$ days to $107{\cdot}3 \pm 2{\cdot}7$ days. This difference is $8{\cdot}8 \times$ P.E.[14]

Recently, with more extended selection toward the suppression of the potential size of the family by a descent from first and second litters only, the fibrosarcoma is no longer the dominant tumour in female mice. This tumour has been replaced by an adenocarcinoma of the mammary gland; the type of tumour appearing in male mice injected with methylcholanthrene has not been changed or replaced by another type. In order to obtain the adenocarcinoma of the mammary gland as the dominant tumour in female mice injected with methylcholanthrene at 60 days of age, the sexes have been kept together and the ensuing young discarded after a few days of life. The controls, that is, the parents of the mice injected with methylcholanthrene, show very few mammary gland tumours spontaneously.

General statement of tumours obtained with methylcholanthrene—In common with other investigators using methylcholanthrene in mice it has been found that a great variety of tumours can be obtained with this carcinogen. The variety of tumours can be increased by hybridisation, by the method of application, the dose and vehicle used, etc. It can also be increased by continuing brother-sister

tumour responds to selection within a limited range, and as soon

very small but, being cumulative over a number of generations, these differences eventually become very significant.

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CHAPTER VII

ENDOCRINOLOGY

ECKSTEIN, P., Birmingham. *The duration of reproductive life in the female.*

In our times of ageing populations, national health and old-age pension schemes, inquiry into the duration of reproductive life requires no justification.

The available information about the subject is very inadequate and refers almost entirely to man. This is not wholly surprising, since a comparative study of this field is beset with difficulties.

The age of animals shot or trapped in their natural habitat is usually difficult and may be impossible to determine. Farmers and professional live-stock breeders, who should know a great deal about domestic animals, are not interested in the end, but rather in the beginning and maintenance and, possibly, stimulation of reproduction. If it ceases or becomes markedly reduced before the death of the animal they will probably retire it from stud duties or dispose of it. Even if they should be unusually interested in following reproductive function till the end, they are not likely to investigate the state of the generative organs and relate it to the previous breeding record of the animal. As for naturalists and veterinary physiologists, the time, cost, and trouble it takes to observe anything other than, say, a mouse or guinea-pig throughout its entire reproductive life is more than most research workers can be expected to give.

Even if the average length of reproductive activity were accurately known for a variety of species, this would mean little, unless it could be correlated with other aspects of the life cycle, such as the

TABLE I

COMPARISON OF LIFE CYCLES (APPROX.)

Species	Gestation (Days).	Age (and *Percentage of* Life Span) at Puberty.	Interval *between* Births (Months).	Duration *of Life* (Years).
Mouse	20	6 weeks (=9 per cent.)	1·5	2+
Bitch	60±2	9 to 12 months (=8 to 10 per cent.)	7 to 8	10+
Rhesus monkey	165	30 to 36 months (c. 15 per cent.)	8 to 10	15 to 20
Woman	266	13·5 years (=19 per cent.)	10 to 12	70
African elephant	660	10 years (c. 25 per cent.)	48	40+
Two-horned rhinoceros	210+	(?) 20 years (? 80 per cent.)	?	c. 25

reaching puberty, some have spent a very insignificant part of their total life span and attained a fraction of their ultimate size, while others are fully grown and have passed the half-way mark of their lives. In other words, equal units of time mean very different things in different animals.

Consider, for instance, one year in the life of a mouse, dog, and human being. At its end the mouse has passed through puberty, [illegible]

reproducing itself. Some of these correlations are shown in Table I, in which the life and reproductive cycles have been compared for a number of species.

The table indicates that it is impossible to design a comparative system based on chronological or physiological "equivalences" (Asdell, 1946), and man, with his protracted growth phase and long-delayed puberty, is particularly difficult to fit into such a scheme.

A. Duration and Character of the Reproductive Phase of Life

For the purposes of this review the extent of reproductive life is defined as that phase in the life of the female during which it is possible for her, if suitable mated, to produce live young.

1. **Puberty**—Puberty, the time at which the reproductive system [illegible]

anovulatory. In monkeys, apes, and women, this period may extend from one to four years after the menarche, the beginning of menstrual activity. Similarly, at the other extremity of life, œstrous or menstrual cycles may persist, but are no longer ovulatory, so that the end of actual reproductive life precedes the end of cyclic activity in the accessory reproductive organs.

It has already been stressed that the age of puberty differs widely in different animals. Other factors which influence its onset are:—

(*a*) *Breed*—For instance, among cows the first œstrous occurs at eight months in Jerseys, and at thirteen months in Ayrshires (Hammond, 1927).

(*b*) *Nutrition*—In practically all animals studied, certainly in rats, cows, and rabbits, sexual maturity is delayed by starvation and accelerated by extra feeding (*e.g.*, Asdell and Crowell, 1935). In fact, there is good reason to believe that body weight or size is a better index of sexual maturity than chronological age.

(*c*) *Season*—In seasonally breeding animals like certain voles, sheep, and goats, young born early in the year may attain puberty

in the autumn of the same year; others born later will not reach it until the following year. Hence, there may be two different ages of puberty in one species.

(*d*) *Individual variation*—In this country some 75 per cent. of normal girls reach the menarche between 12 and 15 years, but the rest are outside this range, and about 1 per cent. each experience their first menstrual cycle either before 10 or after 17 (Ellis, 1947). It is now generally recognised that in tropical races menstrual activity begins no earlier, and may be actually later, than in temperate zones (*e.g.*, Ellis, 1950).

Occasionally menarche, and even complete reproductive capacity, may be established in women at ages far below the usual ones. This was first reported in America by Novak (1944 *a*), who called the condition "*constitutional precocious puberty.*" *He described a series of nine such cases, all of them in girls under 10 years old,* [illegible] *m he found evidence of* [illegible] t mother known was [illegible] 5 at the time she conceive [illegible] (2·7 kg.), and certainly [illegible] (Escomel, 1939). *Evidently, therefore, though most exceptionally, it is physiologically possible for a 5-year-old girl to become a mother.*

2. Fecundity—*Once full sexual maturity or fertility has been* [illegible] elivered [illegible] ed for a [illegible] escribed [illegible] idly to its highest point and then gradually falls again to sterility" (Marshall, 1910). *This was originally said about fecundity in women, but there is no doubt that animals in general behave in the same way.*

One of [illegible] *is the case* [illegible] ed *for ninetee* [illegible] s, *during whi* [illegible] er

TABLE II

BREEDING RECORD OF A EWE

Years of Life.	Lambs Produced per Year.
1	1
2	1
3	2
4	3
5 to 9	3
10 to 15	2
16 and 17	1
18 and 19	0

breeding record is shown in Table II (slightly modified from Pearl, 1913).

The report is of unusual value because it represents the complete breeding and life history of this ewe. It also shows that full reproductive capacity, as opposed to some aspect or part of it, was retained almost until the end.

3. **The length of reproductive life in lower animals**—There is little known about the length of reproductive life in other lower mammals.

them œstrous cycles persist for about 100 days longer, over 750 days, after which the animals are anœstrous as well as sterile. Occasionally both cycles and full fertility persist even longer, and there is a record of a female which bore a litter at the age of 33 months or about 1,000 days (King, 1924).

Much the same appears to apply to other domesticated animals such as cows, horses, pigs, and dogs, almost the only other species about which anything at all is known. Most of the information about them consists of somewhat bizarre and usually single-case reports of reproduction in very old females whose ages happen to be known. They are of relatively little value, since not enough is known about the average or usual reproductive performance and

into three classes: those who have not yet reached sexual maturity, those carrying a young, and those suckling a young; there are no other categories of elephant! The extent to which mature females devote themselves to reproduction is shown by the fact that they have been found to be either pregnant or lactating at ages when their teeth are already completely worn out.

Because of their close relation to man, it is worth adding that

their last cycles tend to be anovulatory.

experience is of some in-

For instance, it has been

ved after parturition, and

who may therefore conceive immediately again, have pregnancies in quicker succession than females allowed to suckle their young (Kirkham, 1919-20). In such females, however, the active stage of reproduction stops earlier, and the total number of litters and young

produced by them is no greater than that of normally reproducing animals.

It would be interesting to know what happens in seasonally, *i.e.*, interruptedly, breeding species, and whether some similar correlation exists in women. Blair Bell (1910) thought that in multiparous women menstruation continues later in life than in women with few or no children. He felt that from the point of the onset of the menop

during which play

and so women, ev

more children, still have their full " allowance of some thirty years of menstrual life. It is difficult to prove or disprove the contention since so few women nowadays have such a number of children. It may equally be held that a small family implies, in the absence of birth control, some inherent difficulty in conception and that this might be associated with an earlier end of ovarian and menstrual cyclicity.

4. **The length of reproductive life in women**—Scripture tells us that Sarah begat Isaac at the age of 90. Even if that statement is treated with some reserve, especially with regard to the length of the Biblical year, it is justifiable to conclude that Sarah was at the time of her conception an old woman, and almost certainly had passed the menopause. The Bible is quite specific on this point, and says that "it ceased to be with Sarah after the manner of women."

There is nothing Up

to 1947 Snaith and

cases of women wh

menopause. Probably many obstetricians and gynæcologists have experience of similar cases in which menstruation with or without ovulation and conception occurred years after artificial production of surgical or radiation menopause (*e.g.*, Rosenberg and Schenk, 1942).

Can fertility in women be retained into advanced old age, say, after 60? According to law—no doubt, taking its guidance from the Bible—a woman of any age is considered potentially fertile, and it seems worth while to inquire up to what ages cases of pregnancy have been reliably reported. This was done recently by Newell and Rock (1952), who found a mere 168 instances of pregnancy in women of 50 years or more among 3½ million births in 1948 in the U.S.A., an incidence of about 1 in 20,000. They also went fully into the literature on the subject and concluded that "parturition in a woman over 52 years of age has not been proved, and that, therefore, were it surely to occur in a woman, say, of 55, it must be considered a gross aberration of reproductive physiology."

This appears to be conclusive enough, but the same authors refer to the case of a woman, reported by Dr J. Kennedy of Dalkeith, who bore her twenty-third child at the age of 62, and had her six

immediately preceding conceptions at regular intervals between her forty-seventh and sixtieth year (Table III).

TABLE III

LAST SEVEN CONCEPTIONS IN DR KENNEDY'S CASE

Year.	Age.
1865	47
1867	49
1869	51
1871	53
1874	56
1878	60 (miscarriage)
1880	62 (reported in *Edinb. med. J.*, 1882).

Of the many exceptional features of this case the most remarkable ones are the vast number of children born, the mother's most unusual age, as well as the regularity of conceptions—and hence of menstruation and ovulation—long after ordinary child-bearing age.

The report rests, of course, on the verbal statement of the mother and on the veracity of the doctor, but the details and circumstances described in the paper make it sound convincing and true. It is possible that the woman may have acted as a cover for an illegitimate child of one of her own daughters, and that Dr Kennedy was a party to this deception. But in that case it does not seem likely that he, living and presumably well-known in a populated suburb of Edinburgh in 1882, would have gone to the length—and risk—of reporting the incident to a learned society. Had his story been false, the other doctors in Dalkeith would probably not have been slow to denounce him as a liar.

If this highly unusual case is accepted, the law would seem to be less mistaken on the issue than one might think.

B. The End of the Reproductive Period

1. **The "menopause" in women and lower animals**—The menopause is so striking and decisive an event in the life of women that [illegible]

protracted in lower animals than in women. As will be described below, it is also unaccompanied by the marked atrophy characteristic of the human ovary after the menopause.

If one may interpolate from the little that is known, there appear to be three intermediate stages in the transition from full fertility to sterility:—

(*a*) Decreasing fecundity as shown by smaller litters and fewer multiple births in women and such animals as sheep.

(*b*) Cessation of ovulation and hence of fertility.
(*c*) Retention of some, usually abnormal, cyclic activity in the accessory reproductive organs, *e.g.*, vaginal or irregular and anovulatory menstrual cycles.

As already mentioned, such manifestations may persist for four-fifths or five-sixths of the total expectation of life in rats, mice, and monkeys, and may do so even longer in elephants.

In women the loss of reproductive function, once it begins, runs a relatively quick and, it seems, irreversible course. In lower animals the basic pattern is probably the same, but is so gradual in its trajectory that its last stages may not be reached before the end of life. This applies particularly to species living in the wild, which presumably die earlier than the sheltered and highly protected domestic animals. It is as though in lower animals the equivalent of the 30-years-odd of the human reproductive phase had been mapped out on a piece of rubber and then stretched, while life itself has not.

2. **The morphological and physiological basis of the terminal decline in reproductive function**—(*a*) Anatomically the characteristic features of the human ovary after the menopause are:—

(i) Reduction in size.
(ii) Absence of ova, Graafian follicles, and corpora lutea.
(iii) Presence of few, if any, primordial follicles.
(iv) Increased fibrosis of the stroma and progressive sclerosis and tortuosity of the ovarian vessels.

The extent to which, for instance, the volume and the relative [illegible] of follicular and epithelial elements of the menopausal [illegible]

TABLE IV

COMPARISON OF OVARIES OF TWO MENSTRUATING WOMEN AGED 27 (A) AND 57 (B)

(*Slightly modified from Taylor* et al., 1952)

	Total Volume (c.c.).	Volume of Corpus Luteum (c.c.).	Volume of Corpus Albicans (c.c.).	Volume of Follicles (c.c.).
A . .	5·491 (100 per cent.)	0 603 (10 9 per cent.)	0	0·615 (11·2 per cent.)
B . .	3·405 (100 per cent.)	0·190 (5·57 per cent.)	0·378 (11·09 per cent.)	0 033 (0 96 per cent.)

Interestingly enough, absolute chronological age seems to matter less than physiological age, as is indicated by a comparison of the

ovaries of two women of 57, one still menstruating and the other not (Table V).

TABLE V

COMPARISON OF OVARIES OF TWO WOMEN AGED 57: ONE MENSTRUATING (A), THE OTHER MENOPAUSAL (B)

(*Slightly modified from Taylor* et al., 1952)

	Total Volume (c.c.).	Volume of Corpus Luteum (c.c.).	Volume of Corpus Albicans (c.c.).	Volume of Follicles (c.c.).
A . .	3·405 (100 per cent.)	0·19 (5·57 per cent.)	0·378 (11·09 per cent.)	0·033 (0·96 per cent.)
B . .	0·574 (100 per cent.)	0	0·148 (25·75 per cent.)	0

By contrast, the ovaries of aged animals tend to show much less involution. As a rule there are well-preserved primordial and

between the ovaries of aged women and lower animals. Although the available histological evidence is very scanty, this appears to be true of senile mice, rats, dogs, cows, and monkeys (*e.g.*, Bader, 1937).

Frequently, loss of reproductive capacity is associated with cystic degeneration of the ovaries. This has been described in most domestic animals and appears to be common in women.

Just at what stage of degeneration of the ovarian follicles this process begins and when an ovary may be called "cystic" are matters for conjecture (*cf.* Taylor *et al.*, 1952). In cows and rats the ovaries may show this condition while the animals are still fertile and vice versa (*e.g.*, Quinlan, Roux, van Aswegen, and de Lange, 1948). At the same time, the marked association between cystic degeneration and reproductive failure is probably not wholly coincidental. It would seem to be worth while to establish the distribution of the process in the aged females of different species,

that the anterior lobe of the pituitary continues to produce

changes in the accessory reproductive organs, in particular atrophy and increasing fibrosis—a condition approaching the castrate state—are all secondary to ovarian failure and can be reversed by giving appropriate hormone treatment. The paradoxical situation arises [illegible] " old " in the sense [illegible] ituitary lobe is still [illegible]

The observation that the ovaries of post-menopausal women are refractory to gonadotrophin (Watson, Smith, and Kurzrok, 1938) fits into this picture. On the other hand, the ovaries of old rats can be, in a sense, reactivated by the same kind of stimulation (*e.g.*, by implantation of anterior pituitary lobes (Zondek, 1935)). This may be interpreted as an essential difference in the ageing process of rodents and women, and implies that in the rat the decline in ovarian function in old age may be due to anterior lobe failure.

No serious attack on the problem of the ageing ovary and falling-off of reproductive function in general is feasible until we have a clear understanding of the structural, hormonal, as well as metabolic changes associated with it. This applies to changes in the reproductive organs, the rest of the endocrine system, and the body as a whole. It must be done on a representative range of animals and include investigation of the marked differences in the type and tempo of the ageing process shown by different individuals and by different strains or breeds of the same species (*e.g.*, Lee, King, and Visscher, 1953).

For instance, it was recently shown that by restricting the caloric value of the diet, without any other change, in rats and mice, the length of life can be increased and the time of ovarian and reproductive failure markedly postponed (Ball, Barnes, and Visscher, 1947; Visscher, King, and Lee, 1952). When fully fed again, such previously " restricted " fem[illegible] produce litters at ages when [illegible]

This finding does not m[illegible] can now be postponed or ad[illegible] decline in reproductive function is not an integral, inseparable part of the process of ageing and can be controlled by non-genetic factors such as the calorie value of the diet.

As yet this is no more than suggestive; there may be other, more important, or profitable lines of approach. It is only when [illegible]

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MASTERS, W. H., and BALLEW, J. W., St Louis. *The third sex*

A DISCUSSION on the lack of sex differential in the hormonology of the aged individual [illegible] to gross similarity between [illegible] age group. A descr[illegible] climacteric of both male and female was detailed, and a comparison of the gross changes in both the male and the female sex was presented. The departure of ageing individuals from a differential sex position to unite in a third sex was described.

MÜHLBOCK, O., Amsterdam. *Hypertrophy of secondary sex organs in old female mice* *

AUTOPSY on old female mice (2 years and older) regularly revealed marked development of secondary sex organs in certain strains.

* This investigation was supported by "Gezondheidsorganisatie T.N.O."

[illegible]

correspondingly marked proliferation, reminiscent of glandular cystic hyperplasia. It is worthy of note that this uterine hypertrophy showed gradual differences in the various strains. In some pure inbred strains the uterine weight showed little or no increase in advanced age. F_1-hybrids showed marked hyperplasia. The mammary gland, in accordance with the uterine hyperplasia, also showed marked development. The gland showed numerous acini filled with secretions, the ducts being wide and also filled with secretions. These [illegible] ment of the acini, [illegible] animals from the [illegible] gland also showed a high iron content, as shown by Berlin Blue staining. Little or no iron is found, however, in the mammary glands of pregnant animals. The significance of this strikingly high iron content in the mammary gland in old female mice remains obscure. The hyperplasia of the uterus and the mammary gland are reminiscent of the effect of prolonged administration of œstrogenic hormone in castrates.

It is therefore the more remarkable that vaginal smears from old animals do not show the picture of "Dauerœstrus," but a regular [illegible] at the age of 2 years.

At the same time one half of the uterus was extirpated and weighed. The other half of the uterus was extirpated and weighed four weeks after castration. Vaginal smears, moreover, were made both before and after castration. It was found that the œstrous phenomena in the vagina disappeared after ovariectomy. The uterus became atrophied, as shown by the following table:—

TABLE I

AVERAGE WEIGHT OF THE UTERUS IN MICE AT THE AGE OF TWO YEARS

Number of Animals.	At Ovariectomy.	Four Weeks after Ovariectomy.
11	298 mg.	78 mg.

The difference was also clearly demonstrated by uterine microscopic findings after castration. The picture of glandular cystic

en was narrow and

be regarded as the source of the œstrogenic hormone. The hormone production in the old ovaries is substantiated by the following experiment. The ovaries of 2 years old mice were transplanted subcutaneously into the axillary region of young castrate mice. After four to six weeks the vagina of these young animals showed signs typical of œstrus; surprisingly, however, œstrus remained continuous in these animals.

In the ovary of a mature animal numerous follicles and corpora lutea in various stages were found. The interstitial tissue showed only scanty development. Ovaries from an old animal were con-

probably the producers of the œstrogenic hormone. A study of ovarian changes throughout various age groups shows that the production of viable ova and the function of the corpus luteum is first decreased, while the production of œstrogenic hormone is maintained well into advanced age. It remains to be explained why

decreased, as demonstrated by the following table:—

TABLE II

PERCENTAGE OF POSITIVE VAGINAL RESPONSES TO SUBCUTANEOUSLY ADMINISTERED ŒSTRONE

Dose in Micrograms.	Young Animals (10 Weeks).	Old Animals (23 to 24 Months).
0·4	100	100
0·3	91	56
0·1	96	0
0·05	48	0
Number of animals .	24	9
Mean body weight .	28 g.	28 g.
Mean liver weight	1·5 g.	1·5 g.

The fact that old animals are regularly in œstrus although the

in

ed

secondary evidence of the increased œstrogenic hormone level in old females. This tumour grows only in the presence of a certain quantity of œstrone. The quantity of œstrogenic hormone normally

found in young females does not suffice for this growth. After transplantation to old animals the tumour showed more marked growth than in young animals.

Average Weight of the Transplanted Tumour

In old animals	15·4 g.
In young animals	9·6 g.

This increas[illegible] [illegible]table to an increased pr[illegible] or excretion. [illegible] of the uterus to œstrogenic hormone does not, [illegible] decrease to the same extent as that of the vagina. The hyperplasia of the uterus is thus attributable to the increased œstrone level in old age.

McGAVACK, T. H., CHEVALLEY, JACQUELINE, PEARSON, S., New York. *Variations in the response of individuals of different ages to an antithyroid compound (methimazole).*

VARIATIONS with age in the gross appearance (1), histology (1 to 6), and function (1, 7, 8, 9, 10, 11) of the thyroid have been described. Indeed, McCay states that "the decline in basal metabolism in old age has been recognised for nearly a hundred years (12)." [illegible] changes in the size of the gland at puberty, with marriage, [illegible] [illegible]nised from ancient times (13). [illegible] num size and possibly [illegible] and 20 years (1). In the elderly, between [illegible] his gland is definitely reduced in size, the colloid is less rich in thyroxin (14, 15), and the blood supply is decreased (3, 16, 17). In conjunction with these involutionary changes which begin about the age of 40 or shortly thereafter, nodule and cyst formations are common (18, 19). Considerable work has been done which is concerned with the ability of hormonal materials to prevent or reverse these changes (20, 21). In view of these variations in thyroid structure and function in relation to age, observations have been made in 184 cases of hyperthyroidism, in which methimazole has been employed, to determine variations, if any, in the response of the hyperthyroid state as influenced by age at the time of treatment.

Subjects, methods, and procedures—The methods and procedures used in studying 184 patients with hyperthyroidism have been described in full elsewhere (22, 23) and will not be detailed here. Of the 184 patients, thirty-five were being prepared for surgery and 147 were given methimazole with a view to long-term treatment. Forty-three of the subjects were hospitalised at the beginning of the therapeutic regimen, not because of their greater severity but in order to carry out a more complete study of the effects of the

antithyroid agent. On these subjects, clinical observations were made and recorded daily; on out-patient cases, such records were made at weekly intervals. Subjective symptoms, such as appre-

appraised at each visit. The basal metabolic rate, total cholesterol, and blood counts were performed once weekly in all hospitalised patients. They were done in all out-patient cases at the same interval until control was established and then at periods varying from two weeks to one month. In some instances radioactive iodine uptake and/or serum protein-bound iodine determinations were used to check the degree of control attained.

Of the 184 patients, 141 or 76·6 per cent. were women, forty or 21·6 per cent. were men, and in three the sex was not recorded. In

found in the neck of four men and two women, but was demonstrable substernally or intrathoracically. In eleven additional patients no

performed in twenty subjects.

In order to ascertain the influence of age upon the action of methimazole these 184 subjects were arbitrarily divided into three groups: Group I—those between 15 and 34 years, including thirty-five women and eleven men; Group II—those between 35 and 54 years, of whom sixty-four were women and twenty were men; Group III—those from 55 to 83 years, among whom thirty-eight were women and seven were men. In nine patients the age was not recorded.

RESULTS

The differences in the clinical behaviour of the three age groups were studied in relation to (*a*) the time required to bring about an initial improvement in the hyperthyroidism; (*b*) the period required to gain complete control of the hyperthyroidism; (*c*) the changes observed in weight, pulse-rate, pulse pressure, and serum cholesterol before and after control was established; (*d*) alterations in the size of the gland under therapy; and (*e*) the incidence of "cures."

from 30 to 40 mg. While some patients stated that they had noticed relief of "inner tension" within twenty-four to seventy-two hours, improvement was not recorded until there was also a definite relief of some of t... toms, such as tremors, hyperreactiv ... itions in appetite or function of ... forth. A decrease in weight loss ... first of the objective phenomena to be noted. Appreciable alterations in the basal metabolic rate and serum cholesterol were rarely observed until

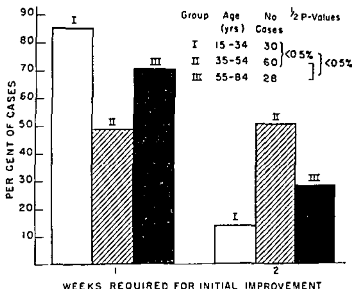


FIG. 1

other indices of improvement were already in evidence. There was no essential difference in the speed with which improvement appeared

age groups responded more readily than did the middle group. During the first week, in Group I there was evidence of improvement in twenty-six of the thirty patients or 85·8 per cent.; in Group II, in twenty-nine of sixty subjects or 48·3 per cent.; and in Group III, in twenty of twenty-eight individuals or 71·2 per cent. These differences are statistically significant when Group I is compared with Group II alone or in combination with Group III, the ½P value in both instances being less than 0·5 per cent.

2. **The period of time required to gain control of the hyperthyroidism** (Fig. 2)—Observations on this point were made in 137 of the 184 patients, of whom 113 or 82·4 per cent. were brought to a euthyroid state within five weeks of initiating therapy. Fig. 2 is based upon data from 105 subjects who received daily a dose of 30 to 40 mg. until control was established. Of these, 100 or 95·2 per cent. were controlled by the end of the fifth week of therapy. In Group I twelve of the twenty-eight subjects or 42·8 per cent. were controlled by the end of the third week, an additional twelve

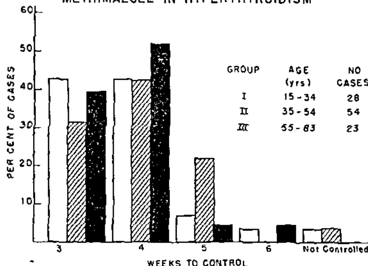


Fig. 2

by the end of the fourth week, one was never controlled, and the remainder became euthyroid by the end of the sixth week (Fig. 2). In Group II seventeen of fifty-four cases or 31·5 per cent. were euthyroid by the end of the third week, an additional twenty-three became so during the fourth week, twelve during the fifth week, and the remaining two were never satisfactorily controlled with the dosages mentioned (Fig. 2). In Group III nine of twenty-three patients or 39·1 per cent. were non-toxic by the end of the third week, twelve or 52·1 per cent. more became so during the fourth

3. Variations in clinical findings (Tables I, II, and III)—At each visit of the patient it has been our custom to check not only changes in subjective phenomena and clinical signs but also to determine weight, pulse-rate, blood-pressure, basal metabolic rate, serum cholesterol, blood counts, and, in selected instances, the serum protein-bound iodine. Calculated in relation to age, the basal metabolic rates were within normal range in all subjects who were completely controlled. In the 125 subjects upon whom determinations of serum cholesterol were made, ninety-nine showed a progressive increase in the value, sixteen a decrease, and ten no essential change. The direction and magnitude of the *change* was not significantly different when a group or combination of groups was compared with any other, nor did those with nodular goitres behave in a materially different fashion from those with diffusely hyperplastic glands.

TABLE I

CHANGES IN WEIGHT IN THYROTOXIC PATIENTS OF VARIOUS AGES TREATED WITH METHIMAZOLE

Age Group.	Direction of Change in Weight.		
	Gain.	Loss.	No Change.
15 to 34 .	38	3	2
35 to 54 . .	63	9	8
55 to 84 . .	33	5	3
Age not recorded .	4	0	0
Totals .	138	17	13

From Table I it would appear that there is a trend for a higher proportion of the subjects in Group I to gain *weight* under treatment than for those in the other two age brackets. However, these differences had no statistical significance. It would have been interesting to have studied the gains in weight quantitatively in relation to the optimal weight and to the poundage actually gained in each individual patient of the three groups. Unfortunately this analysis has not been made. However, it is our impression that the patients with Graves' disease, and hence the younger subjects, tend [illegible] a greater extent than [illegible]

[illegible] numbers of individuals [illegible] before treatment and below that figure after the thyrotoxic state was controlled. In all, 146 of the 184 patients to whom methimazole was given had such pre-treatment levels. Of the remaining thirty-eight subjects, twenty-one who had previously been controlled by another antithyroid compound prior to the use of methimazole were not

included in this analysis; of the additional seventeen, age was not recorded in nine, and in seven the pulse-rates were below 88 per minute despite the presence of recognisable thyrotoxicosis. In the three groups respectively, beginning with the youngest, we found a reduction to within normal range in thirty-five of forty, fifty-three

TABLE II

VARIATIONS IN THE PULSE-RATES OF THYROTOXIC PATIENTS TREATED WITH METHIMAZOLE

Age Group.	Pulse Above 88 Beats per Min.		½P Values.
	Before Treatment.	After Treatment.	
15 to 34	40	5	Between 0·5 and 2·5 per cent.
35 to 54	72	19	
55 to 83	34	15	
Totals	146	39	

0·5 and 2·5 per cent.).

oldest group, but not for any other comparison, separately or in combination.

In Table III we have listed a group of 153 patients who were

Group I, of twenty-nine patients with a pulse-pressure greater than 60 mm. of mercury before treatment a reduction to normal levels accompanied methimazole administration in twenty-six. Similarly, thirty-six of fifty subjects and eleven of thirty-one patients in

than 0·5 p ... Groups II and III ... between Groups I ... (½P less than 0·5 per cent.).

4. **Alterations in the size of the thyroid** (Fig. 3)—In ninety of the 184 patients studied, a record was kept of alterations in the size

3. Variations in clinical findings (Tables I, II, and III)—At each visit of the patient it has been our custom to check not only changes in subjective phenomena and clinical signs but also to determine weight, pulse-rate, blood-pressure, basal metabolic rate, serum cholesterol, blood counts, and, in selected instances, the serum protein-bound iodine. Calculated in relation to age, the basal metabolic rates were within normal range in all subjects who were completely controlled. In the 125 subjects upon whom determinations of serum cholesterol were made, ninety-nine showed a progressive increase in the value, sixteen a decrease, and ten no essential change. The direction and magnitude of the *change* was not significantly different when a group or combination of groups was compared with any other, nor did those with nodular goitres behave in a materially different fashion from those with diffusely hyperplastic glands.

TABLE I

CHANGES IN WEIGHT IN THYROTOXIC PATIENTS OF VARIOUS AGES TREATED WITH METHIMAZOLE

Age Group.	Direction of Change in Weight.		
	Gain.	Loss.	No Change.
15 to 34 . .	38	3	2
35 to 54 . .	63	9	8
55 to 84 . .	33	5	3
Age not recorded .	4	0	0
Totals .	138	17	13

From Table I it would appear that there is a trend for a higher proportion of the subjects in Group I to gain *weight* under treatment than for those in the other two age brackets. However, these differences had no statistical significance. It would have been interesting to have studied the gains in weight quantitatively in relation to the optimal weight and to the poundage actually gained in each individual patient of the three groups. Unfortunately this analysis has not been made. However, it is our impression that the patients with Graves' disease, and hence the younger subjects, tend in general to lose weight more rapidly and to a greater extent than the older thyrotoxic subjects.

In Table II are segregated by groups the numbers of individuals who had *pulse-rates* above 88 per minute before treatment and below that figure after the thyrotoxic state was controlled. In all, 146 of the 184 patients to
pre-treatment levels. Of
twenty-one who had previc
thyroid compound prior to the use of methimazole were not

included in this analysis; of the additional seventeen, age was not recorded in nine, and in seven the pulse-rates were below 88 per minute despite the presence of recognisable thyrotoxicosis. In the three groups respectively, beginning with the youngest, we found a reduction to within normal range in thirty-five of forty, fifty-three

TABLE II

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Age Group.	Pulse Above 88 Beats per Min.		½P Values.
	Before Treatment.	After Treatment.	
15 to 34 .	40	5	Between 0·5 and 2·5 per cent.
35 to 54 .	72	19	
55 to 83 .	34	15	
Totals .	146	39	

of seventy-two, and nineteen of thirty-four subjects. The behaviour of the first group is significantly different from that of either of the two remaining groups or from these two in combination (½P between 0·5 and 2·5 per cent.).

There is a trend for the pulse to subside to normal levels more commonly in the young than in the two older groups. This difference is statistically significant when the youngest is compared with the oldest group, but not for any other comparison, separately or in combination.

In Table III we have listed a group of 153 patients who were

60 mm. of mercury before treatment a reduction to normal levels accompanied methimazole administration in twenty-six. Similarly, thirty-six of fifty subjects and eleven of thirty-one patients in Groups II and III respectively showed, under treatment, a lowering to normal of previously high values. These changes are statistically significant for comparisons between Groups I and III (½P is less than 0·5 per cent.), between Group I and a combination of Groups II and III (½P lies between 0·5 and 2·5 per cent.), and between Groups I and II combined as compared with Group III (½P less than 0·5 per cent.).

4. **Alterations in the size of the thyroid (Fig. 3)**—In ninety of the 184 patients studied, a record was kept of alterations in the size

TABLE III

CHANGES IN PULSE PRESSURE DURING THERAPY WITH METHIMAZOLE

Age Group.	Total Number of Patients.	Before Treatment.		After Control.	
		Above 60.	Below 60.	Above 60.	Below 60.
15 to 34	42	29	13	3	39
35 to 54 .	73	50	23	14	59
55 to 83 .	38	31	7	20	18

This table excludes all patients known to have had high blood-pressure prior to onset of disease.

of the thyroid while under treatment with methimazole. Unfortunately the age of six patients was not recorded. In Fig. 3 are shown the essential data for the remainder. It is no doubt true that the

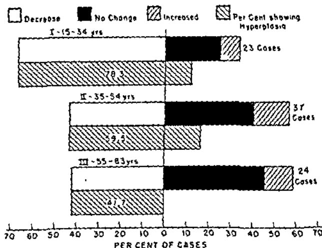


FIG. 3

gland decreased in size in fifteen of the twenty-three cases in Group I, in sixteen of thirty-seven of those in Group II, and in ten of twenty-four in Group III (Fig. 3). The larger number of subjects with a diminution in the size of the gland in Group I as compared with either of the other groups is probably related, at least in part, to the higher incidence of diffusely hyperplastic glands in this group (78·3 per cent. as compared with 59·5 and 41·7 per cent. in Groups II and III respectively). None of the differences in *size from group to group have any statistical significance within the* 5 per cent. level of confidence. However, the ability of the gland

TABLE IV

"CURES" IN THYROTOXIC PATIENTS COMPLETING A COURSE OF THERAPY WITH METHIMAZOLE

Age Group.	Total Number of Patients.	"Cures."	
		Number.	Per Cent.
15 to 34 .	17	13	76·5
35 to 54 .	23	14	60 9
55 to 83 .	15	7	46·6
Totals .	55	34	61 8

is known. Thirty-seven were prepared immediately for surgery. This leaves ninety-six, of whom forty-one were still receiving methimazole therapy when the data for the present study were closed. This leaves fifty-five patients in whom the long-range *effects of methimazole could be analysed. Of these, thirty-four or* 61·8 per cent. have been considered "cures" or recoveries. This is undoubtedly a weighted figure, as it must be presumed that at least some of the fifty-one cases not followed have received other therapy. If we assume that all of them did, then the percentage of cures drops to 32·1 per cent. The actual results to be obtained probably lie somewhere between the latter figure and 61·8 per cent. From Table IV it will be noticed that there is a tendency for the percentage of cures to decrease with age. None of the differences is significant within the 5 per cent. level of confidence.

DISCUSSION

The differences that have been observed in the action of methimazole in patients of various ages may be related to the variations

TABLE III

CHANGES IN PULSE PRESSURE DURING THERAPY WITH METHIMAZOLE

Age Group.	Total Number of Patients.	Before Treatment.		After Control.	
		Above 60.	Below 60.	Above 60.	Below 60.
15 to 34 .	42	29	13	3	39
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of the thyroid while under treatment with methimazole. Unfortunately the age of six patients was not recorded. In Fig. 3 are shown the essential data for the remainder. It is no doubt true that the

CHANGES IN THE SIZE OF THE THYROID IN THYROTOXIC PATIENTS DURING TREATMENT WITH METHIMAZOLE

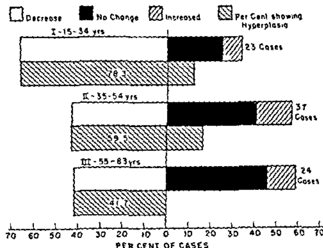


FIG. 3

in Group I than in Groups II and III. A reduction in the size of [illegible]

the 5 per cent. level of confidence.

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in the natural courses of hyperthyroidism, to the nature of the

nearly constant association with emotional or mental stresses, factors which seem to exert less influence upon the nodular goitres of older individuals.

Some of the factors influencing thyroid-gonodal relationships have been earlier summarised (24). More recently (25) attention

which it is more difficult to achieve or to maintain normal thyroid function.

In the present series of cases the type of gland, *i.e.*, whether diffusely hyperplastic or nodular, seems to have played little part in the final results attained. Nor has it materially influenced the speed with which the thyrotoxic state could be controlled by the antithyroid compound. However, the diffusely enlarged glands of Graves' disease have been observed to decrease in size more frequently than the nodular goitres. Astwood and his associates (26) believe that prolonged remissions are related to a decrease in the size of the thyroid while the patient is under treatment with an antithyroid compound followed by a return to normal at the time treatment is discontinued.

Irwin *et al.* (27) feel that the length of time required to bring the patient to a euthyroid state varies directly with the size of the goitre. Bartels (28, 29) and Kendrick *et al.* (30) are of the

of time nor a larger dose of drug are necessary to control the toxic nodular as compared with the diffusely hyperplastic toxic gland.

SUMMARY

For 184 thyrotoxic patients undergoing treatment with methimazole, data have been analysed in relation to three age groups (Group I—15 to 34 years, Group II—35 to 54 years, and Group III—55 to 83 years). Initial improvement was first seen in Group I, and control of the thyrotoxic state was more readily established in Groups I and III than in Group II. During treatment, patients in Group I gained weight more readily than the other two groups, but they also lost more easily when out of control. A return to normal in pulse-rates, systolic, and pulse pressures was more rapid

WELFORD, A. T., Cambridge. *Introduction.*

THE papers in this chapter rep
performance and its changes
normal healthy individuals.
essentially that of the experimental psychologist. It borders on the one hand upon physiology and on the other forms a starting point for the study of employment in relation to age, in that basically most of the problems of employing older people arise directly or indirectly from the limitations imposed by changing abilities.

The first paper, by Mr Norris and Dr Shock, reports an experiment conducted on a strictly physiological model but the implications of which lie on the border between physiology and psychology. The remaining papers fall into two groups representing two different but complementary approaches current in general psychological work. Those by Mr Singleton, Dr Szafran, Dr Birren, Mrs Verzár-McDougall, and Dr Kay deal with laboratory experiments which attempt a detailed examination and analysis of performance at defined tasks. Practical considerations restrict such experiments to small numbers of subjects and thus introduce questions of whether the samples studied are representative. This difficulty can, however,

task and another.

Almost all work of this type has been conducted with human subjects rather than animals. Human subjects have the advantage, especially for pioneer studies, of greater range and subtlety of

The papers by Dr Jones, Dr Wechsler, and Mme Pacaud represent psychological testing studies, in which the detailed, analytic

from changes of performance with age at one or other test as from differences between the changes at different tests.

It is significant of the stage which psychological studies of ageing have reached that the simple gathering of facts has given way to

CHAPTER VIII

EXPERIMENTAL STUDIES OF CHANGES IN PERFORMANCE WITH AGE

WELFORD, A. T., Cambridge. *Introduction.*

The papers in this chapter report studies of co-ordinated purposive performance and its changes with age at different types of task in normal healthy individuals. The field in which this work lies is essentially that of the experimental psychologist. It borders on the one hand upon physiology and on the other forms a starting point for the study of employment in relation to age, in that basically most of the problems of employing older people arise directly or

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tions do not attach to experiments on animals such as those reported by Mrs Verzár-McDougall, which thus form a valuable aid to the interpretation of human studies.

The papers by Dr Jones, Dr Wechsler, and Mme Pacaud

of mental and psycho-motor functions relevant to employment.

CHAPTER VIII

EXPERIMENTAL STUDIES OF CHANGES IN PERFORMANCE WITH AGE

Exercise—The exercise was performed on a bed which was reinforced to eliminate some of the energy losses. The subject exercised manually by cranking an electrodynamic brake ergometer which was calibrated by standard engineering practice so that the deflection of the output voltmeter indicated instantaneous rates of work. The reclining position was used throughout the test to eliminate the effects of postural change.

Testing procedure—The basal subject was brought to the testing room at least one hour before the test began. After reclining on the test bed he was fitted with a face mask, a blood-pressure cuff, and E.K.G. electrodes. When the subject was resting comfortably two 40-litre collections of expired air were made for estimation of the basal oxygen consumption by the open circuit method. These were followed by a work bout of pre-arranged rate and duration, after which the subject dropped his arms to his sides and rested quietly for a forty-minute recovery period. After the beginning of exercise, ventilatory rates were recorded for each 10 litres of expired gas. Air samples were taken from the two B.M.R. collections and from each 10-litre block of gas for the first 200 litres expired, and then from each 40-litre block until the end of the forty-minute recovery period.

Analyses and calculations—The air samples were analysed for oxygen and carbon dioxide content on the Haldane apparatus. All gas volumes were reduced to standard conditions (0° C., dry, and 760 mm. Hg).

Net mechanical efficiencies were calculated as the caloric equivalent of work done on the ergometer divided by the caloric equivalent of the total excess oxygen consumed. It was assumed that the R.Q. was 1 during the exercise used here. The excess oxygen consumed was determined by extrapolating the best arithmetic estimate of the asymptote of the recovery curve to the beginning of exercise and calculating the total oxygen above this line. The asymptotes had the same mean value as the B.M.R. determinations made immediately prior to exercise, but the reliability of the asymptote was somewhat better than the reliability of the B.M.R. determinations. Fig. 1 shows a typical experiment. The asymptote is represented by the broken line and the excess oxygen is represented by the stippled area. The t-test was used to estimate the level of

pairs of means.

probability that t

I ... te of 450 kg.-metres

and 494 kg.-metres

of work, and at a constant total amount of 500 kg.-metres each performed at rates of 135, 267, and 449 kg.-metres per min. Some of the subjects in the younger groups were able to perform larger total amounts of work and to work at higher rates. All cranking rates were between 48 and 87 revs. per min. Work bouts were performed on separate days and in random order with the period

serious attempts to assign causes for observed changes of performance. The measure of agreement revealed in the present symposium makes it clear that although much patient research remains to be done, a number of leading questions and principles are becoming defined.

NORRIS, A. H., and SHOCK, N. W., Baltimore. *Age differences in the efficiency of manual exercise in males.*

MEASUREMENT of human mechanical efficiency and the factors which effect it have been of interest to physiologists and others for many years. The advent of modern methods of ergometry and calorimetry intensified activity in this area and resulted in numerous experiments on a relatively small number of subjects. Although the efficiency values for most of these studies are quite comparable in range, there are conflicting reports of the effects of work-load and duration of work on efficiency.

The mechanical efficiencies of people of different ages have been compared previously. Two studies are notable. In 1927 von Gessler and Markert (15) reported the efficiency of performing unilateral arm exercise at a work rate of the order of 120 kg.-metres per min. In eighteen subjects from 17 to 64 years of age, efficiencies ranged from 16 per cent. at 17 years to 24 per cent. at 40 to 50 years and 20 per cent. at 64 years. In 1938 Robinson (13) reported studies in which he used fifteen minutes of treadmill walking to exercise his ninety-three subjects who ranged in age from 6 to 76 years. The work used for the efficiency measurements was sufficient to raise the oxygen intake to about seven times the basal level in his average subject. His efficiency estimates, made from the ninth through the fourteenth minutes of exercise, ranged from 12 to 20 per cent. (means, 14 to 17 per cent.). His data showed no significant age differences in efficiency after maturity.

The present study was designed to compare the mechanical efficiency of subjects of various ages at work rates intermediate to those reported above.

METHODS

Subjects—The sample consisted of five men 24 to 29 years of age, five men 63 to 68 years of age, and five men 80 to 84 years of age. The 20 years old group included three laboratory workers, a medical student, and a patient from the Gerontology research ward at the Baltimore City Hospitals. All were in good physical condition, but none were in training as athletes and only two had ever been in training. The 60 and 80 years old subjects were selected from patients on the research ward and in the infirmary. All subjects were active, in good health, and adequately nourished. *Subject selection* was based on ability to perform the work and the absence of adverse symptoms resulting therefrom.

Exercise—The exercise was performed on a bed which was reinforced to eliminate some of the energy losses. The subject exercised manually by cranking an electrodynamic brake ergometer which was calibrated by standard engineering practice so that the deflection of the output voltmeter indicated instantaneous rates of work. The reclining position was used throughout the test to eliminate the effects of postural change.

Testing procedure—The basal subject was brought to the testing room at least one hour before the test began. After reclining on the test bed he was fitted with a face mask, a blood-pressure cuff, and E.K.G. electrodes. When the subject was resting comfortably two 40-litre collections of expired air were made for estimation of the basal oxygen consumption by the open circuit method. These were followed by a work bout of pre-arranged rate and duration, after which the subject dropped his arms to his sides and rested quietly for a forty-minute recovery period. After the beginning of exercise, ventilatory rates were recorded for each 10 litres of expired gas. Air samples were taken from the two B.M.R. collections and from each 10-litre block of gas for the first 200 litres expired, and then from each 40-litre block until the end of the forty-minute recovery period.

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Experimental design—At a constant work rate of 450 kg.-metres per min. each subject performed 135, 202, 350, and 494 kg.-metres of work, and at a constant total amount of 500 kg.-metres each performed at rates of 135, 267, and 449 kg.-metres per min. Some of the subjects in the younger groups were able to perform larger total amounts of work and to work at higher rates. All cranking rates were between 48 and 87 revs. per min. Work bouts were performed on separate days and in random order with the period

between successive tests on an individual varying from twenty-four hours to as much as four months. The average period was three

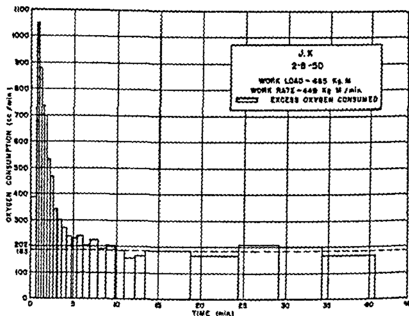


FIG. 1

Oxygen consumption (cubic centimetres per minute) is plotted against time (minutes) for a single experimental run on J. K., aged 68. The broken line represents the asymptote of the recovery curve (183 c.c. per min.). The basal oxygen consumption was 202 c.c. per min. The stippled area above the asymptote represents the total excess oxygen consumed from the beginning of exercise (zero time).

days. There was random order of testing subjects of different age groups.

RESULTS

Fig. 2 shows total excess oxygen consumed plotted against total work and work rate. With increasing total amount of work there were no significant differences in excess oxygen consumed between various age groups at similar levels of work. With increasing work rate there were significantly higher excess values for the 80-year group at 135 kg.-metres per min. and for the 60-year group at 586 kg.-metres per min. than are found for the younger groups. There were no age differences at the intermediate levels.

Table I (p. 218) gives the average values of net mechanical efficiency for each age group at each work level. Significantly *decreased efficiencies were found at the lowest work rate* (135 kg.-metres per min.) for the 80-year group and at the highest work rate (586 kg.-metres per min.) for the [illegible]0-year group.

There is a clear trend of increase in efficiency with increase in total work and therefore increase in duration of work in the

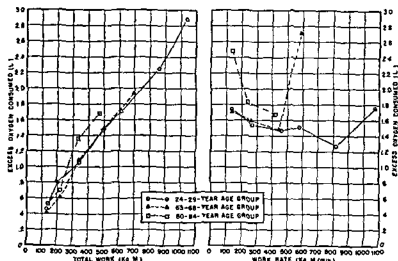


Fig. 2

Total excess oxygen consumed (litres) is plotted against total work (kilogram-metres) and work rate (kilogram-metres per minute) for three age groups.

young group. However, only the two lowest efficiencies (total work=135 and 202 kg.-metres) and the highest efficiency (total work=853 kg.-metres) are significantly different.

DISCUSSION

From the present results as presented and from previous data it appears that measurements of mechanical efficiency in humans

$$\text{Duration of work} = \frac{\text{Total amount of work done}}{\text{Rate of work}}.$$

The term "efficiency," as used here, does not imply any assessment of muscle energetics. Instead, it compares the work output to the apparent metabolic cost of exercise performed through a complex neuromuscular system, similar to that used in running or riding a bicycle. However, the lower level of work in arm exercise is more consistent with the abilities and presumably decreased

TABLE I

AVERAGE NET MECHANICAL EFFICIENCY

Age Group.	Total Work (Kilogram-Metres).						
	135.	202.	350.	494.	597.	853.	997.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
24 to 29 .	13·42±0 69	12·10±1·31	15·11±0·18	15·95±1·01	16·74±0·44	17·95±0·35	16·68±0·28
63 to 68 .	15·38±1·46	17·62±1·85	15·10±0·58	15·85±1·0			
80 to 84 .	13·28±1·45	14·79±1·70	11·94±1·58	13·66±1·16		.	..

Age Group.	Work Rate (Kilogram-Metres per Minute).			
	135.	267.	449.	586.
	Per cent.	Per cent.	Per cent.	Per cent.
24 to 29 .	13·56±0·50	15 24±0·79	15·95±1·01	15·98±0·71
63 to 68 .	13·99±0 61	14·31±0·53	15·85±1·0	10 66±0·76
80 to 84 .	8·75±1·62	11·95±0 65	13·66±1·16	...

arrangement is regarded as a convenient standardised method of [illegible]

that more than aerobic muscular work (1), the decreased efficiency of short duration work is readily explained by the larger proportion of anaerobic work in the shorter of two bouts of work performed at the same [illegible]

c

exercising on a bicycle ergometer at work rates of 690 and 920 kg.-metres per min. at a constant rate of movement of 61 pedal revs. per min. Efficiency estimates based on the net cost of the work decreased significantly from 21·2 per cent. at a lower work rate to 19·3 per cent. at the higher work rate. These values are comparable to " steady state " efficiency values (2, 3).

Mechanical efficiency has not been shown to be appreciably [illegible] 4, 5, 6). present

and low rates of work might result from a differential effect of cranking rate, muscle load, or co-ordination ability between old and young subjects.

Previous studies (4, 5, 11) show that for young subjects the effects of rate of movement on efficiency are only apparent at less than 23 or more than 100 revs. per min. In this study cranking rates between 48 and 87 revs. per min. were used to avoid these limits. Although the older man may have a narrower range of uniform effect of cranking rate on efficiency than the young man, it would need to be less than 50 per cent. of the width of the young [illegible]

where similar reduction in efficiency was noted in the oldest subjects.

The decreased efficiencies of the older subjects might be explained by the failure of the older subject to co-ordinate muscular effort as well as the young subject. This explanation would apply equally well to either the high or low levels of work. Derangement in the timing of contraction and relaxation of antagonistic muscles might cause them to do work against each other.

Hursh (9, 10) has shown that in cats the time of conduction of an impulse to the limb muscles is constant during growth. However,

from the fourth to the ninth age decade, there is an increase in conduction time of the ulnar nerve of humans (about 20 per cent.) which is not accompanied by any change in arm length (12). Thus, this adaptive mechanism of growth does not apply to the ageing process. In addition, decrements in pursuit and digital reaction speed between the ages of 20 and 80 years have been reported (11).

effort but also by decreased mechanical efficiency in older subjects performing appreciable amounts of work.

Thus the inability of the older man to co-ordinate his movements as well as the young man would seem to be the best explanation of the reduced efficiencies measured here.

SUMMARY

The male subjects in each of three age decades (third, seventh

(135 to 449 kg.-metres per min.) were performed at a fixed total amount (500 kg.-metres). Net oxygen consumption for all of the work and forty minutes of recovery was used to estimate the total metabolic cost of the exercise.

The older subjects were found to be less efficient than the younger

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SINGLETON, W. T., Kettering. *Age and performance timing on simple skills.*

Introduction—The work described in this paper is concerned with perceptual motor skills. This category includes all industrial tasks where the operator uses his hands and feet to move materials or machine controls in response to information which he receives through his sense organs. It is convenient to divide the operator's activity into two parts: the overt behaviour or motor action and the perceptual activity. This separation is merely a functional one but it at least serves the purpose of focusing attention on the mental processes which accompany any kind of skilled muscular action.

The experiments outlined below are concerned with the influence of central processes on movement times. A movement is regarded as an element in the behaviour of the intact organism —what Lashley

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planning. One of the most obvious characteristics of skill is the integration of the multitude of different parts, successive actions follow smoothly and without the intervention of conscious control. There are no points in time defined by the completion of one part and the start of another, since anticipation is always present and is nearly always effective. From this point of view the experimental

activity, the planning and the execution.

The Four-choice Experiment

designed

between his knees and moved the lever as indicated by the lights. Only one light was on at any time. He was instructed that, for each of the four possible signals, there was one correct lever move-

He returned the lever to the centre, and here another light would appear. When the lever was returned to the centre point it was mechanically held there for about a twentieth of a second to prevent overshooting. The subject could have no logical way of predicting which light would come on next. He had to stop, see the light, and then make the next movement. If he moved down a channel not appropriate to the particular illuminated lamp, the lamp would not go out. A buzzer sounded at the completion of a trial when sixty-four correct responses had been made. The subject carried out six trials. After each trial he was given his total time and the number of errors he had made.

Results—For every correct response three time readings were taken, each accurate to the nearest hundredth of a second. The centre time was that between the appearance of the stimulus and the initiation of the response as recorded by the entry of the lever into one of the four guiding channels. The time taken to move to the end of the channel where the light went out and the time taken from then until the return to the centre were also recorded separately.

no conclusion can be reached except the negative one that there are no obvious age trends.

Discussion—It will be noticed that, in this task, the subject has to decide which direction he is going to take before moving the lever from the centre point. He then makes the outward movement and the light either stays on or goes out telling him whether the movement was correct or wrong. The response is then completed by the return to the centre point, but he receives no information from the display concerning the next movement until the previous correct response is completed. The centre time can therefore be regarded as a four-choice serial reaction time; it appears to increase not large, but it is statistically component is the "end-point plus return movement" time which shows a regular decrease from 20's to 50's followed by an abrupt increase. These changes are also apparent in the "moving out" time but the only statistically significant change in either is the abrupt increase from 50's to 60's mentioned above. A comparison of the 50's and 20's on this "end-point plus return movement" time reveals that the former are significantly faster only at the 10 per cent. level. The continuation of this trend through the 30's and 40's suggests, however, that the effect may be a real one.

It will be noticed that the changes with age in centre time and movement times respectively are quite different. A total time measure which is a combination of these together with error time would, considered alone, reveal changes with age which would be

almost impossible to interpret in any psychologically meaningful way. Even with the analysis of times as taken on this task it is clear that at least two variables are influencing the changes of movement time with age. *The next experiment was designed to investigate* the apparent increase in speed of movement from 20's to 50's.

Repetitive Movement Experiments

Introduction—In the previous task the experimenter noticed that the older subjects appeared to treat the lever much more roughly

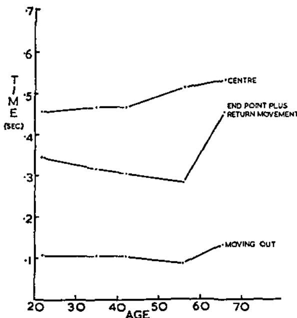


Fig. 1

Component times on sixth trial at four-choice task.
(Seconds per subject per response.)

[illegible] This suggests a possible reason for

by the lever mechanism and were, in fact, slowing down before reaching the end of each movement. To provide numerical evidence relevant to this hypothesis the following tasks were devised.

The tasks—(A) The control was a lever which could be moved freely for 18 in. along a straight line in a horizontal plane. There were sprung stops at each end of the traverse. The subject was given practice to get the feel of the lever and was then instructed to move to and fro between the stops as quickly as possible, taking care to

touch the end at each reversal of movement. The trial lasted for about fifty single movements.

(B) The apparatus consisted of two brass discs 1 in. in diameter and 18 in. apart from centre to centre. Each disc was inset in a 2-in. square aluminium plate. The separation between brass and aluminium was just sufficient to ensure electrical insulation. The

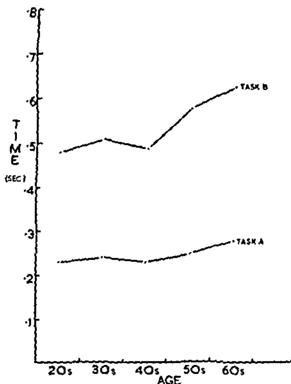


Fig. 2

Times for a single movement on repetitive movement tasks.
A, Externally guided movement.
B, Subjectively aimed movement.
(Seconds per subject per movement.)

subject held a stylus in his dominant hand and was instructed to

did both tasks. The mean movement times calculated just as in the previous experiment are shown in Fig. 2. The error functions on task B showed no obvious age trends.

From the moving lever in task A records were taken of the times of various parts of the movement. The time at the end-point, the time for the first quarter, the time for the middle half, and the time for the last quarter of each movement were separated. Their variations with age are shown on Fig. 3.

Discussion—The most important point about Fig. 2 is that, within a series, it takes just over twice as long to aim a movement (task B) as it does to move the same distance with the help of mechanical guides (task A). In both cases the movement time appears to increase more or less regularly with age.

The time for the middle half of the movement, shown on Fig. 3,

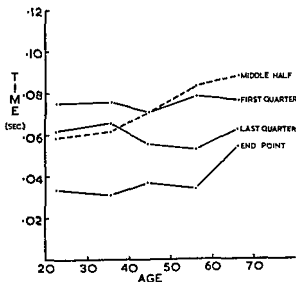


Fig. 3

Component times of a single movement on task A.
(Seconds per subject per part of movement.)

suggests that the average cruising speed is decreasing with age. This is presumably determined by the contraction and relaxation rates of the agonists and antagonists respectively. The time for [illegible] be regarded [illegible] case of cruising speed. This is not necessarily a [illegible]

curve on Fig. 3 is another demonstration that what a man can do in a discrete case is not necessarily the same as what he actually does

in a serial task. In contrast to the other parts of the movement it seems that the time for the last quarter tends to decrease with age. Comparing older and younger subjects the difference in means is not statistically significant, but it is clear that, as a function of age, this time is behaving in an unusual way. In conjunction with the evidence from Fig. 1, it is reasonable to conclude that when moving a lever up to a physical stop older people do not slow down as much as do younger ones.

The end-point time on Fig. 3 shows an abrupt change between the 50's and the 60's similar to that in the "end-point plus return movement" time curve on Fig. 1. It can therefore be argued that in the latter case the end-point time was the factor determining the function at the upper end of the age scale. There is, however, an important difference between the conditions of the two experiments. In the four-choice task information was available for the display at the end-point, whereas in task A there was no visual information available at this stage. A further experiment was carried out to investigate the influence of visual information on end-point times.

The Two-choice Experiment

The task—The subject sat facing a display and had a control lever between his knees just as in the four-choice experiment. In this case, however, there were only two lights; they were arranged horizontally on the display panel. The possible directions of lever movement are shown diagrammatically on Fig. 4.

The two alternative responses were lever movements via the paths CJE_1JC and CJE_2JC. Since choice-times were not the main subject of study in this experiment the task was, in this respect, made as simple as possible. The control-display relationship was [illegible]

pattern shown on Fig 4 with the two lights at the points E.

The first light was switched on by the experimenter and the subject made the double movement CJE. When the lever reached [illegible]

The light series was irregular: the subject could not predict his next movement before the completion of the previous one. Each subject was given three trials on the task; a trial involved the completion of forty-eight correct responses. About fifty subjects were used with approximately equal numbers in each age group.

Results—For each correct response, eight time measures were recorded. The time spent at C, moving from C to J, at J, moving from J to E, at E, moving from E to J, at J, and moving from J to C. Almost all the errors made were manipulative ones at J; such error times at J were omitted in calculating the means. There was no

marked error trend with age. The data of Figs. 4 and 5 were extracted from records of the final trial.

Discussion—The changes with age in the four moving times are all of the same form. The stationary times against age curves are all four of the same form but, as a class, appear to be different from the moving times. The stationary time curves show the general characteristics of the " end-point plus return movement " of Fig. 1, and the " end-point " of Fig. 3. The stationary time " centre time "

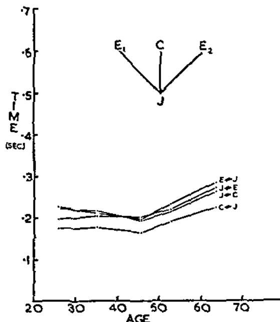


FIG. 4

Moving times on two-choice task.
(Seconds per subject per movement.)

on Fig. 1 does not show these characteristics, presumably because this time is determined by the necessity to decide which way to move rather than merely to change direction. The stationary times of Fig. 5 can be considered separately since the action required is different in each case. At C the movement must be reversed and at the same time a new stimulus appears. At J the movement direction *must be altered, but there are no display changes.* At E the *movement* must be reversed and at the same time the stimulus light goes out if the previous movement was correct or stays on if it was wrong. The separate cases can best be compared by dividing the sample of subjects into two halves, taking 47½ years as the line of separation. This yields a younger group of subjects of average age 34 years,

in a serial task. In contrast to the other parts of the movement it seems that the time for the last quarter tends to decrease with age. Comparing older and younger subjects the difference in means is not statistically significant, but it is clear that, as a function of age, this time is behaving in an unusual way. In conjunction with the evidence from Fig. 1, it is reasonable to conclude that when moving a lever up to a physical stop older people do not slow down as much as do younger ones.

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The two alternative responses were lever movements via the paths CJE_1JC and CJE_2JC. Since choice-times were not the main subject of study in this experiment the task was, in this respect, made as simple as possible. The control-display relationship was [illegible] "natural" one. A correct response to a light on the left was to [illegible] for the right. The directions [illegible] lines forming the [illegible] points E. [illegible] experimenter and the [illegible] the lever reached E the light went out if the response was correct, and another stimulus appeared when the lever was returned to C. A movement C to J required a knob displacement of about 4 in., from J to E about 6 in. The light series was irregular: the subject could not predict his next movement before the completion of the previous one. Each subject was given three trials on the task; a trial involved the completion of forty-eight correct responses. About fifty subjects were used with approximately equal numbers in each age group.

Results—For each correct response, eight time measures were recorded. The time spent at C, moving from C to J, at J, moving [illegible] from J to C. [illegible]; such error [illegible] there was no [illegible]

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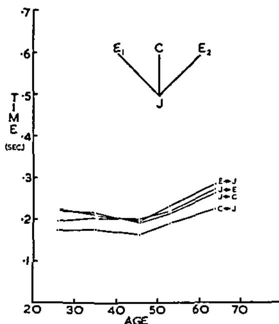


FIG. 4

Moving times on two-choice task.
(Seconds per subject per movement.)

The separate cases can best be compared by dividing the sample of subjects into two halves, taking 47½ years as the line of separation. This yields a younger group of subjects of average age 34

and an older group of average age 55 years. The older men are most different (80 per cent.) from the younger in the "at E" component. This would suggest that older people either wait to perceive confirmation of their correct movement or use the disappearance of the stimulus as a signal that the movement is complete. *At C the older men are 50 per cent. slower than the younger, although*

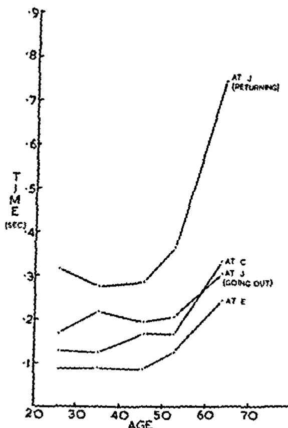


FIG. 5
Stationary times on two-choice task.
(Seconds per subject per event.)

the choice is between only two alternatives, and the subjects need not [illegible] The difference between older [illegible] lever is [illegible] manipu- [illegible] under these conditions the groups are 60 per cent. different. There was very little manipulative difficulty in moving in the direction CJE, and in this case the difference between older and younger is about 25 per

cent. This, however, remains greater than the largest percentage difference between younger and older in terms of moving time (18 per cent.).

Thus, it seems reasonable to conclude that older people have a stronger tendency to watch display changes at the end of movements. They also take longer to initiate new movements after the completion of old ones when no information (excepting kinæsthesis) necessary for the organisation of the movement becomes available at the time.

Final Discussion

Research in the field of gerontology would appear to have been much more concerned with somatic changes than with psychological ones. There are several good reasons for this. The majority of studies have been carried out by medically qualified workers whose training provides a considerable knowledge of bodily functions but a much less adequate one of mental functions. Somatic changes are relatively easy to observe and to quantify, so that there is a natural tendency to underrate or even to ignore the importance of psychological changes other than at the social level of emotions and prejudices.

There is a parallel instance in the industrial field, where methods study, developed largely by engineers, has been almost entirely concerned with limb movements rather than with the mental activity which accompanies them. The repetitive movement experiments above provide one illustration of the importance of central control

motility measures reveal much greater deterioration with age than do reaction measures. These results have been used by other investigators (though this is not true of Miles himself) to support the conclusion that changes with age are predominantly peripheral rather than central in origin. All the tasks used by Miles as motility measures were such that some changes of direction of movement were included in the time intervals measured. The experiments described in this paper indicate that it is in these phases where changes with age are most marked and it is suggested that the deterioration can be related to underlying differences in central rather than in peripheral functioning.

The hypothesis is that older people are not so efficient in the anticipatory planning of a series of movements and that by the middle 60's many are reduced to " programming " one movement at a time. This would account for the abrupt rise in the " end-point plus return movement " of Fig. 1, and the " end-point " of Fig. 3.

The older people, who build up the programme for only a relatively short time ahead of the action, are forced to make longer stops between movements if the action is to be kept under control.

Considering task A there are at least two possible explanations for the decrease with age in time for the last quarter of the movement:

1. The older men may be more reluctant or less able to control the extent of a rapid movement and prefer to rely more on the end of the physical guide as a means of stopping the lever.
2. The older men may be less able or less willing to utilise a mental model of the movement required so that their anticipatory knowledge of the physical and/or temporal position of the end-points is not so accurate as that of younger men.

These possibilities are not mutually exclusive. As they are stated the first could be one of the consequences of the second, but they also could have different physiological causal backgrounds: (1) may be located as a less dominant effector control by older people, while (2) could be a decrease in functional activity at the more central level of imagery. It is probably not very profitable for a psychologist to try to separate the influence of these variables. In terms of overt behaviour the two may never be distinguishable. Szafran (1951) has met a similar and perhaps the same problem in trying to determine why older people, in perceptuo-motor tasks, rely more on visual information to reinforce proprioceptive cues.

However it is possible to specify the conditions in the four-choice task which resulted in the negative slope of the movement time curve from 20's to 50's. These were: (1) a movement restricted by physical guides; (2) a movement relatively small in extent so that the slowing near the end-point by younger people was sufficient to make their total movement time longer than that of older people.

It will be noted that the behaviour of the older men was more adaptive in terms of the requirements of the task. Hick and Bates (1950) point out that a "moving fixation" in which both agonists and antagonists are in tension requires greater energy expenditure than does a "ballistic movement" which depends more specifically on the agonists. If, in fact, the younger men were making moving fixations and the older men ballistic movements then the effects observed can be regarded as a consequence of a hypothesis by Miles (op. cit.). He suggested that, with increasing age, mental conservation mechanisms are built up to economise on energy expenditure.

The longer end-point times with increasing age are presumably partly due to a longer time needed to reverse a movement which has approached completion with higher velocity, but the two-choice experiment indicates that this is not the only factor. The greatest difference between older and younger was at the end-point, where the stimulus light disappeared. This may, of course, be a mani-

festation of the greater care and accuracy employed by older people, but in view of the above discussion it also seems possible that the older subjects are using the display change as a visual cue that the end-point has been reached. This is in line with the hypothesis suggested earlier since the reluctance or inability to plan ahead may well be related to a reduced capacity to form and hold the mental model for action.

ACKNOWLEDGMENT

The work described in this paper was carried out while I was a member of the Nuffield Unit for Research into Problems of Ageing,
I am greatly indebted
the Director for advice
designed an electronic
1952). This machine
made practical the elaborate recordings taken in my experiments.

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SZAFRAN, J., Cambridge. *Experiments on the greater use of vision by older adults.*

In the course of administering a simple perceptuo-motor task to groups of male adults, ranging from the 20's to the 60's, it was observed that the middle-aged and older individuals tended to give direct visual attention to an action which most of the younger carried out by touch alone. Specifically, the task was such that whilst the subject attended to a display in front of him, he was required to move his hand to and fro between a position some 90 degrees to the side. The observation was confirmed in a serial reaction time experiment (in which the subject had to operate a

or less continuously at what they were doing. The experimental data suggested that restriction of the visual peripheral field, found with the usual perimetry in older adults (Ferree and Rand, 1930), could not alone account for the observed tendency.

In the search for a more adequate explanation an attempt was made in the first instance to exclude visual information experimentally,

In one experiment, the subject sat in an enclosure facing a display of indicators and was required to locate with a pointer a number of targets around him in space under two conditions: when he was able to make whatever use he chose of direct vision, and wearing a pair of red goggles through which only the display could be seen. With a group of subjects between 20 and 60 years of age, it was found that, when unable to make use of vision, the older had far greater difficulty in locating the targets and attempted to supplement tactile and kinæsthetic cues by making postural adjustments, turning their heads in the direction of the target at which they were aiming. Orientation in the dark (as measured by the incidence of attempts to locate a target not corresponding to a given signal) was equally well maintained by all individuals for the duration of the experimental session (about half an hour). There were indications, however, that familiarity with the motor aspects of the task was of particular importance for the older subject, and that without this familiarity he could not approach the task confidently when vision was excluded. The older individuals took more time than the younger over those portions of the task which were concerned with the initiation of a fresh action, but no age differences were observed in the speed of execution of individual movements.

The accuracy of blind positioning movements was further investigated in another experiment. Here a blindfold subject was required to move his hand, holding a pencil, to a terminal position at the side and then to return it to the starting-point in front of the midline of his body. With a group of subjects from the 20's to the 70's it was found that, when no knowledge of results was available [illegible]

[illegible] sideration of the memory factor, another plausible conjecture was that the locus of the difficulty lay for the older subject in the comparison of impressions from vision and kinæsthesis.

The result was taken as suggesting that a shift was desirable from pre-occupation with blindfold performances to a study of eye-hand co-ordination under conditions excluding vision of the limb and of the control. Accordingly, in one experiment the subject sat at a table which had two levels, one directly above the other. The top level carried a display of numbered discs arranged at varying [illegible] level had [illegible] t could [illegible] equired [illegible] nd over [illegible] With [illegible] error in distance between the starting and terminal positions was found to be relatively small and not related to age. It was observed that subjects were putting their hands to positions which they judged to

be more or less directly underneath the indicated points. In view of this the same subjects were further required to carry out another set of movements when the display was presented at the same distance from the eyes (*i.e.*, about 17 in. as measured from the centre of the array of discs) but in a vertical plane. Under these conditions the error was found to be larger for the majority of subjects and to increase with age, the difference between the two tasks being relatively more pronounced for the older than for the younger individuals. No evidence of the possible effects of the horizontal-[illegible] present in the data.

[illegible]

easily slid alongside the lower level. In one condition the display [illegible] table some 3 ft. away [illegible] display was set up [illegible] ditions a cloth, fixed alongside the top edge of the table, excluded visual information from the arm and the control. All movements were carried out [illegible] one at a time. If the movement was [illegible] If the movement [illegible] remained on the display and there was nothing to indicate the size or direction of the error. The subject made in this manner as many attempts as he required to match correctly a given distance. With a group of subjects from the 20's to the 50's it was observed that when the [illegible] most individuals tended to draw imaginary

[illegible] systematic relation between age

[illegible]

to achieve a correct match on the first attempt, and their performances could be only in part accounted for by reference to their relatively more deliberate manner of dealing with the task. Under both conditions the number of unsuccessful attempts preceding a successful one in a trial did not vary with age. This was taken to indicate that the older subjects had as good a grasp as the younger of the kinæsthetic scale built in the course of performance. As in the previous experiment, no evidence of the horizontal-vertical illusion was present in the data.

Considering these observations and data cumulatively, it is suggested that they emphasise in a general way the relatively greater

importance of direct visual information in middle and later life. This broad result is in line with the observations of Sheldon (1948), who noted the frequent incidence of difficulty in the dark among people above the age of 65. A link between Sheldon's survey data and these experimental observations appears to be contained in an anecdote quoted by Miles (1933): "When the late Charles W. Eliot of Harvard was about 84 he told me that the chief change noticed in his powers as he grew older was that he had to give direct visual attention to the performance of manual habits. He said: 'If I lift a glass of water I must now keep watch on it or the glass may slip from my hand. A few years ago the hand itself would entirely take care of such a matter.'" Here is a case, as Miles puts it, "of the more purely psychological processes stepping in to save the situation when the physiological service has become impaired." Hypotheses such as that of the possibility of a "deficit" in the kinæsthetic functions, considered also by Sheldon, receive some support from threshold measurements of passive movement and vibratory sensitivity (Laidlaw and Hamilton, 1937; Pearson, 1928),

the present results on this question it seems that, over the age range studied, none of the observed trends suggests any obvious failure within the peripheral receptor system. They do, however, point to a difficulty, apparently increasing with age, in linking the visual and kinæsthetic impressions when visual appraisal of the moving limb is not possible and a transposition from the display to the control is required. Possibly the "schema" relating vision and movement, established in infancy, becomes gradually blurred. An important feature of the situations here studied has been the holding in mind of one thing while dealing with another—in other words, the short-term memory function which is observed in learning experiments to decline with age. Possibly the requirement imposed on the subject in these tasks of attending simultaneously to perception and action may result in poorer performance if the "carrying of information" mechanism can be assumed to "break down" on a very short time scale. In addition, it is not unlikely that the more cautious and exacting approach which the older adult seems generally to adopt when faced with laboratory tasks may in itself bring about poorer achievement in the cases of partial elimination of clues here considered. The apparent preference of the older adult for being guided in his activities by the largest possible picture of the

the need for stronger "input," required perhaps to effect those processes intermediate between perception and action which have to be gone through.

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BIRREN, J. E., Bethesda. *Age changes in speed of simple responses and perception and their significance for complex behaviour.*

ONE of the facts clearly shown by studies of ageing is that simple responses and perception become increasingly slow in later life (1, 22, 30, 33, 47). However, the general significance of these

duction of answers is an artifact of output mechanisms uncorrelated with the quality of the thought processes or mental "power." The opposing view is that the slow rate of responses is most likely the result of a slowing in speed of perceiving and integrating elements of the tasks and is thus an important feature of what we call mental ability.

In the early stages of learning a skill, performance is slow and inaccurate. After a point when no further errors are made, speed continues to improve. Hence even for a task wherein no errors are made there are gradations of ability which are revealed by the time required (20). The converse might be expected also, that when a skill begins to deteriorate through disuse or other cause, the time required will increase before the stage when errors are made (47). There is some indication that the latter proposition is valid, but we need further experiments because of the weakness in our knowledge of the precise relations of speed, accuracy, and difficulty (14, 43). Clues about the nature of some of these relations may be gained by watching our own adjustments to aid performance of difficult tasks.

problem, we may

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ms to aid correct

perception of difficult words and to some extent enables us to hold on to the "memory" longer. The relations between rate of input and repetitions are not so simple. If a speaker goes slowly each item may be very clearly perceived by the listener, but the early words in the series may be lost; they seem to fall out of the active memory if too long a time elapses before they are combined into a perception or meaning.

The present paper will review some data on age changes in *speed of simple processes and in so far as possible draw inferences* about the significance of these changes for complex behaviour.

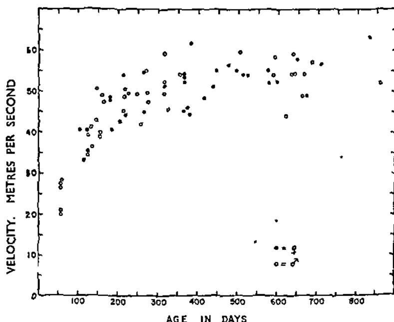


FIG. 1

The relation of conduction velocity and age in the sciatic nerve of albino rats. Measurements were made on excised nerve at 37° C. Each point represents an animal.

Conduction velocity of peripheral nerve—Brody reported that [illegible] days, remains [illegible] years (12). [illegible] later life is due to a reduction in the conduction velocity of peripheral nerve. Present results, however, indicate that conduction velocity is not an important factor. Conduction velocity in the rat increases up to about 300 days and remains relatively unchanged thereafter. These results were obtained from measurements on sciatic nerves excised from seventy-five albino rats ranging in age from 50 to 850 days (Fig. 1).

A section of nerve about 60 mm. was placed on silver electrodes in paraffin oil at 37° C. Two pick-up electrodes lay 20 mm. apart in the middle portion and a third electrode was placed on the cut end of the nerve. Stimulus electrodes were at the distal end and a supra maximal square-wave potential of 0·18 m/sec. duration was used to stimulate. Action potentials were recorded photographically from an oscilloscope tube. Conduction velocities were computed from the time required for the action potential to pass the 20 mm. distance between pick-up electrodes.

Several studies have reported changes in conduction velocity of human motor nerve (32, 42, 46). Norris *et al.*, in a study of 175 individuals from age 20 to 89, reported a drop in velocity of about 10 m./sec. from age of maximum, 30 to 39, to age 80 to 89 (32). As these investigators pointed out, this change would account for only about 4 per cent. of reported reductions in speed of reaction, *e.g.*, digital flexion to a light or sound stimulus. Assuming a path of 1 metre, the reduction in velocity would amount to only ·004 seconds.

In childhood, reflex times increase progressively after age 5 to 7 years, presumably because of the increase in limb length after the age when motor nerves reach their maximum conduction velocity. Knowlton and Britt showed a progressive increase in patellar reflex time in the age range 6 to 20 years (26). Yet it is over the same span of years when simple reaction time decreases (30). A similar decrease is seen in the rat during development (12).

It seems reasonable to conclude that in human and in rat development and ageing, variations in conduction velocity of peri-
... importance in speed of simple reactions

... usual handwriting digits or words printed in large type ... blank. In the patients, linkage between the *perception of the digit* ... slow and inefficient.
... then a wrong digit
... would be incorrectly
... formal observations
... young adults when
... e circumstances the
... *become dissociated*
so that an individual might respond verbally in a correct manner and then do something inappropriate. The changes in handwriting in senile psychotics may not follow the same pattern as might be produced by the effects of ageing, fatigue, drugs, and disuse, although we know in this instance at least that the loss of speed in a simple skill has some important implications for the state of the individual.

Age changes in speed and accuracy of addition—Writing speed might act as a limiting factor in determining how many simple addition problems can be done in a fixed time because of the time taken to write the answers (8). An important question is whether writing speed has any relation to the speed or accuracy of events preceding the writing of the answer. When subjects are required to add rapidly series of digits and to write their answers, it is found that writing speed is correlated with the time of the total task. This

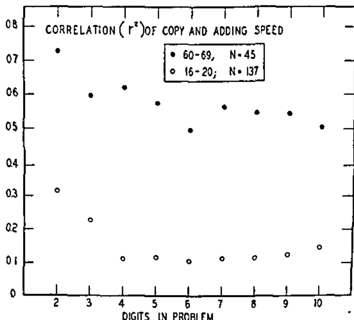


Fig. 2

The correlation between speed of writing digits and rate of completing addition problems of different lengths.

correlation holds even for long series of digits, *e.g.*, 10, wherein the total time taken to record the answer is but a small proportion of the total time (Fig. 2).

were the case, the correlation between writing speed and total addition time would be expected to drop more for the elderly than

Actually

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the output of the elderly. These results indicate that slowing in

point this minimum operation time may begin to impair serial tasks such as mental computation because the memory-held task components are lost by the time integration is required.

One approach to the question of identifying the nature of the underlying speed factors in ageing is an analysis of the relation of speed and accuracy. An attempt was made to express speed of *addition, T(n), and accuracy, P(n), as functions of the number* of addition operations, *n*. Having both T and P expressed as functions of *n*, P was written as a function of T: $P(n) = P_0$ expressed $\left[-a\left(\frac{T(n)}{k}\right)^{1/m}\right]$. This expression gives the probability of correctly

operation and a

whether the slowing in computation and other simple skills is accompanied by a change in the use of language, since development and ageing of the intellect cannot be discussed adequately without giving emphasis to the use of language. Man, unlike other species, has developed symbols for his beliefs and feelings and can transmit them to the young. Individuals who rapidly acquire words, store them, and have them available for future combinations are regarded as "intelligent." One of our best practical indicators of intelligence is the vocabulary test, which simply measures verbatim recall of stored information (25, 35, 44).

Vocabulary size does not diminish in later life; in fact, for the highly educated it may increase slowly throughout the life span (18). How rapidly the words are used is another question; a preliminary report indicated that verbal fluency or speed of verbal association is slower in the aged (6).

Insight may consist of a new combination of a group of simultaneously available words or meanings. In this vein a thought may

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of new combinations of meanings is a function of the time required to complete the sequence of events.

Our daily environment may be looked upon as a stream of *information containing among other things different numbers of* words and different relative frequencies of words (49). A large vocabulary in an elderly person implies that he was surrounded by a large stream of information during his life span, could acquire this information and store it for later use. It does not necessarily imply that at the time of testing the individual could acquire new words with the same facility he did in earlier years. The biologically minded investigator is interested in the learning and perceiving apparatus used in acquiring and maintaining language, whereas the social scientist is largely interested in vocabulary as it depends upon the content of the stream of information surrounding the individual. Schulman and Havighurst (37) found vocabulary size varied with socio-economic status, using the vocabulary test of Seashore and Eckerson, which yields an estimate of the total number of words in the individual's recognition vocabulary (38). This *avoids the usual limitation of a vocabulary test based upon an* arbitrary list of words having no known relation to the total content of our language. We may still underestimate the size of children's vocabularies compared with adults, since they are exposed to high frequencies of words not yet in the unabridged dictionary. As one grows older, the amount of new information or words entering the environment is probably small in relation to what has already been presented [illegible] time in the life of most persons it seems likely that a po[illegible] when the number of new words entering [illegible] out.

It has [illegible] only a small fraction of the spe[illegible] ry or critical to convey a meaning (28, 40). [illegible] ly to perceive a few words in a sentence to catch the meaning. [illegible]e high redundancy of speech and the environment operate to the advantage of the very aged. *Thus despite impaired perception or periods of* inattention, the individual is able to behave correctly on the basis of a few clues. The redundancy of the environment is also manifest in social conventions and social graces which may persist very late in the senile psychoses (24). Such an individual may be adequate in the highly "redundant" phases of daily life, but is confused if the usual pattern of events is changed or if the usual sequence of words is altered.

These are a few of the implications of a quantitative study of language, ageing, and the nature of the intellect. The data to be discussed are concerned with the rate of flow of words or verbal fluency. Assuming equal familiarity with the words (41), the most fluent person is the one who can most quickly list words, *e.g.*, names of countries of the world, or makes of automobiles (11). Reducing the number of words available for association presumably would reduce the rate of association. There are more words beginning

with "S" in the English language than with any other letter. Thus we might expect that a subject could write more words beginning with "S" in two minutes than words beginning with "Q," an infrequent category. The categories of words selected in the data to follow were designed to give a wide spread in the number of available words. In this way the responses of the elderly and young could be compared as a function of the number of available words.

The subjects were asked to write as quickly as they could, for two minutes each, words beginning with "S," "C," "N," "Q," the two letters "Gi," and an additional category in which they could write any word they could think of regardless of the initial letter. A rest interval of about two minutes elapsed between trials. The number of words written in a two-minute trial was a subject's score, omitting repetitions and neologisms, but including proper names, plurals, and different forms of the same word, *e.g.*, run and running. Misspelt words were counted when they could reasonably be identified.

An estimate of the number of words in each category was made by counting the number of pages in the unabridged dictionary devoted to the letter or combination of letters (31). A total of 33,726 words was counted on 426·5 pages sampled randomly in the dictionary, giving a mean of 79·1 words per page and a σ of 4·5 words. Omitted from the word counts were the foreign words listed at the bottom of each page. The estimated number of words beginning with the various letters of the alphabet is given in Table I. The error of any estimate is given by $\sigma_x = \sqrt{N_x} \cdot 4{\cdot}5$, where N_x is the number of pages for the letter.

TABLE I

ESTIMATED NUMBER OF WORDS BEGINNING WITH DIFFERENT LETTERS OF THE ALPHABET IN AN UNABRIDGED DICTIONARY (31).

A	15,112	J	2,214	S	29,022
B	13,467	K	2,214	T	14,812
C	22,909	L	7,410	U	3,851
D	19,390	M	11,356	V	4,112
E	7,789	N	4,088	W	7,576
F	9,165	O	5,456	X	261
G	7,481	P	21,612	Y	1,004
H	8,691	Q	1,416	Z	688
I	7,085	R	11,245		

The subjects for this study were previously described (8); their [illegible] here. The total number was

in groups; writing was done with pencil.

The older subjects listed fewer words in all categories (Table II). However, the elderly were relatively slower for the "easy" letters,

TABLE II

AGE CHANGES IN VERBAL FLUENCY. THE NUMBER OF WORDS WRITTEN IN TWO MINUTES. SUBJECTS WERE INSTRUCTED TO WRITE AS QUICKLY AS THEY COULD WORDS IN DIFFERENT CATEGORIES.

Age.	No.	Any Word.		S.		C.		N.		Q.		Gi.		Writing Speed.*	
		x.	σ.	x.	σ.	x.	σ.	x.	σ.	x.	σ.	x.	σ.	x.	σ.
16 to 19	127	42·3	8·8	24·7	6·6	20·7	5·8	15·0	4·9	9·2	3·2	5·2	2·7	45·2	5·2
20 to 29	31	40·2	10·4	24·9	7·0	22 0	6·6	15·4	5 1	9·1	3·9	5·6	2·7	48 0	6·6
30 to 39	33	46 4	13·5	29 0	6·1	25·2	6·6	18·3	6 0	11·2	4·5	7·7	3·9	47·1	9·7
40 to 49	32	38·7	13·4	24 8	7·2	20·0	7·1	13·6	4·9	9·5	4·2	6·8	3·6	38·0	12·0
50 to 59	28	30·2	13·4	17 0	7·0	16 0	3·3	11·9	4·7	6 0	2·8	5·0	2·7	29·4	12·0
60 to 69	43	14·6	9·7	9·7	4 6	8·4	3·8	7·6	3·8	4·4	2·6	3·4	2·1	22·0	9·7
70 to 79	30	9·9	4 8	6·0	3·2	5·6	3·6	4·2	0·8	2·7	0·6	1·6	0·6	16·5	7·3
80 to 89	17	7·2	3·5	5·5	3·9	5·6	4 1	5·1	2·6	2·8	0 8	2·2	0·6	15·2	7·0

* From Reference (5).

such as " S," where a large number of words exist to choose from. This suggests an age difference in the minimum time required for the process. When there are few words available, *e.g.*, " Q," then the young and elderly are more nearly alike in performance, since there is time to exhaust almost all the commonly known words in the category in two minutes. It cannot be assumed that the older persons were necessarily picking from a smaller population of words,

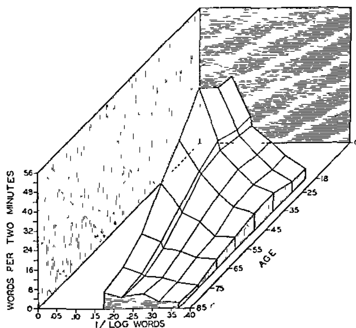


FIG. 3

[illegible]

since a previous study of the same population showed little change in vocabulary size with age (19).

It is obvious in Table II that the number of words written is a function of the number of available words. When age and the number of words written is plotted against the reciprocal of the logarithm of the number of words in the category, a surface is described which illustrates these relations (Fig. 3). As measured in this study, the lower fluency of the elderly does not seem to be the result of simple inability to write quickly enough, since the elderly wrote fewer words in proportion to their potential writing speed than did the younger subjects (Table II).

The group of 131 high school students gave seventy-six different words beginning with "S" for the first word listed. This is remarkable diversity considering the fact that the most commonly listed word, "sit," was used by only eight subjects; the next most frequent words were "sing" and "stop," each listed six times. For the entire group, 75 per cent. of the first words listed beginning with "S" were used by only one subject. By the tenth word listed this percentage had risen to 86, indicating even greater diversity. Words beginning with "Q" are less common and only 60 per cent. of the first responses were used by only one subject. A hypothesis for future checking is that the elderly will show less diversity among their responses because of overlearning of the common words.

The existence of an unsuspected factor in verbal fluency was suggested by the results of tests with the senile patients (9). Some of the patients listed words that were "logical" but inappropriate for the assigned letter. Thus a list requiring words beginning with "S" might contain *swim, water, cloud, rain,* etc., as though each word served as a stimulus for the next, leading the subject astray from the task. Attempts to correct such performances gave the impression that these patients were lacking the ability to inhibit the logically associated words, *i.e.*, the associations were stronger and had priority over the task "set." For persons of all ages each word tends to evoke associated words, but the associations inappropriate to the task set are rapidly discarded. It does not seem that such associations would be stronger in senile psychosis. Instead it seems more likely that the patients are unable to maintain a task-set strong enough to lead to inhibition or rejection of inappropriate words. The extreme condition was shown by a few advanced patients who persevered by writing the same initial word over and over again, as though the word was a stimulus for itself.

Welford *et al.* found a tendency among older subjects to make associations about a series of statements instead of drawing inferences (47). In this instance also, the associations may have had a priority due to their number and strength but may also have resulted from a weakening of inhibition or maintenance of a task-set.

Definition and localisation of the processes of ageing—The output of the elderly appears to occur at a slower but more constant rate than in the young (10). This implies that young adults modulate the speed of their responses over a much broader range than do the elderly. We do not know whether this difference is due to a change in a facilitation mechanism for motor responses or whether it is part of the total slowing noted in older persons. It has been demonstrated that more intense visual, auditory, or gustatory stimuli yield faster reaction times ((34), pp. 387 to 395). In general, the stronger the peripheral stimulus the shorter the reaction time. The spread of excitation along a neural chain presumably is faster after intense stimulation because the threshold conditions at the internuncials are more quickly met (27). Since one of the conditions of the threshold is that some minimum number of neural elements be

fired simultaneously, loss of neurons as might occur in ageing may delay the spread of excitation. Thus time (48) and intensity relations are of considerable relevance to problems of ageing.

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emergence of the percept is correlated with its intensity. Because of reduced effectiveness of our sense organs in later life more energy is required to yield the same stimulation. In the case of the eye, a small pupil, increased scattering and absorption of light in the transmission media, and loss of sensory elements, means that less of the stimulus energy is available to stimulate fewer receptors (2, 3, 4). *Raising the level of illumination helps older people relatively more* than young persons; a fact of considerable practical value (47). Studies on ageing and perception have to be concerned with the differences in sensory input, and these relations do not appear simple.

The fusion threshold for a flickering light goes up with the brightness level. From this one might expect that older persons would show a greater elevation in fusion threshold as brightness is increased. However, Coppinger found that the fusion threshold went up more in young subjects than in the elderly when he increased the brightness of the stimulus (15). Thus some of the differences in perception are not merely the result of a lower sensory input. A related study on the fusion threshold suggests that such results are due to ". . . a lengthened restoration period in the functioning of the visual mechanism with increasing age" ((16), p. 388).

Welford and his associates have given attention to localising the changes of ageing and have placed an emphasis upon the processes of organising incoming information and relating it to appropriate material (47). Analysis of the Wechsler-Bellevue Scale suggests that

disturber of memory and that psychosis adds only a little to an already marked disturbance of function. Doubt is thus thrown on the generalisations ordinarily made about senile and arteriosclerotic memory." ((39), p. 6). The term "memory" needs rigorous definition in connection with studies of ageing. Eysenck and Halstead analysed fifteen memory tests and found that they correlated so highly with a general factor of intelligence that they believed there was no necessity for postulating a separate memory

seem useful in this area, however,

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12 per cent. lower in persons in their 60's compared with persons in their 20's (21). Cameron found that senile patients could remember series of three digit numbers for several minutes. If, however, spelling was interpolated between the memorising and the recall, then recall was difficult or impossible (13). Control subjects had no similar difficulty. Jones and Kaplan interpreted such results as indicating an increased susceptibility to retroactive inhibition in senile psychosis ((24), p. 86). Such an interpretation is applicable to studies of age and learning.

Ruch has reported that learning is relatively more difficult for older persons when it conflicts with past habits (36). Welford *et al.* reported a related finding that the elderly had more difficulty unlearning a sequence containing errors than in learning a new sequence (47). It is difficult at this time to determine whether the

the elderly.

Under some very practical circumstances it appears that perceptions do not always flow through the consciousness of older persons quickly enough to permit effective behaviour. An example of this are the attempts of an aged person to cross a busy street intersection. By the time the scene is scanned, the presence of cars and their movements and the state of the traffic signals noted, the decision of the individual to move into the street may be antiquated. That is, the response is no longer appropriate to the conditions which evolved during the interval of perceiving and integrating the pertinent information. Sometimes there appears to be a

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more common in the elderly and may be related to distractiveness.

While it should be apparent that we do not have enough information about conditions which affect perception, there seems to be little doubt that some of the complex behaviour of ageing adults is affected by changes in perceptual abilities. In some instances it seems possible to interpret the behaviour of senile patients as resulting from inability to make required discriminations. Thus two stimuli which may be quite discrete for normal persons may be equivalent to the senile patient, with a resulting blocking of response and the appearance of irrelevant crisis behaviour.

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VERZÁR-McDOUGALL, JEAN, Basle. *Learning and memory tests in young and old rats.*

In connection with research on the physiological aspects of ageing, we were interested to find an experimental method which would allow a comparison of the learning and memory capacity of old and young rats. We chose the multiple-T alley maze, which has been proved by Stone and many others (1, 2) to be capable of

showing differences between individual rats and between different strains of rats. Stone (3) used such a maze for a study of the age factor in learning, and although he was not primarily interested in old age, he tested a few 2 years old rats along with his young and adult groups. His results show no consistent age differences in learning, but he did find that some of the old rats relearned very badly. The experiments reported here continue the study where Stone left off, with special emphasis on the behaviour of old animals.

Methods—The rats used in these experiments were of a pure albino strain, inbred during twenty-four years in the Physiological Institute of the University of Basle. They were very tame and were always handled by one experimenter only.

The motivation was hunger, the rats being fed a limited quantity (20 gm.) of stock diet and 20 gm. of dry maize corn (of which they only eat the germ) on arrival at the end cage after finding their way through the maze. They were not fed at any other time, but water was always available in the living cages. Adult rats lost weight during the thirty-days' trials to about 10 per cent. of their body weight. Young growing rats of 2 or 3 months were kept at a constant weight for the first fifteen days and then allowed to grow slightly (about 1 gm. per day) throughout the remaining fifteen days.

The maze used was a deep alley, multiple-T formed maze built on the design used by Marx (4) in his experiments to test the influence of glutamic acid in learning. There were thirteen choice-points, and the maze was fitted with five drop-doors to reduce retracing. It was placed on a raised table in a darkened room and illuminated from above. The experimenter observed the movements of the rats in a mirror suspended above the maze. Time taken and the number (and position) of forward-going errors were recorded for each rat. The rats were taken in random order and only one trial per day was made, at approximately the same hour each morning when the rats were hungry. Food was placed in the end cage at the end of the maze and the rats always ate eagerly on arrival. Six trials a week were made.

There was no evidence of rats following the spoor of the rat which had run before. The number of mistakes and the time taken to run the maze were remarkably characteristic for each rat; but the mistakes made by any one rat were not always into the same [illegible]

[illegible]

with male rats.

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them into the [illegible]
rats to pass th [illegible]
their food for [illegible]
trial in the ma: [illegible]

similar to that of the maze, with a right-angle bend at the beginning and end so that the food cage is not visible from the entrance of the straight-away. In this way, the rats have learnt within five days [illegible]

[illegible] discovery of food at the end of the alley.

As criterion of learning the less severe of the two criteria used by Stone (3) was used, *i.e.*, not more than three errors in three successive trials. We also added a time criterion of not more than sixty seconds for three successive trials. The groups are compared by taking the average number of trials to reach the criterion of learning and the criterion of time, and the average number of total errors for the thirty trials.

Memory [illegible] for peri[illegible] days on [illegible] repeatin[illegible]

Results

A. Learning Tests

1. *Young and adult rats*—Since old rats were not at first available, we started these experiments with comparative studies on young growing rats 2 months old (70 to 90 gm.) and young adult rats 9 months old (250 to 280 gm.). The results are seen in Table I.

The average number of trials to learn were 18·3 for all the 2 to 3 months old groups (forty rats) and 16·4 for all the adult 8 to 9 months old groups (thirty-three rats). The difference between these two averages is not significant, since the individual variations within the groups are very great, especially in the young groups. In group B, of ten male 2 months old rats, we had two rats which learnt the maze in five and six trials respectively, one of these rats making only sixteen total errors in thirty trials. (The worst learner in this group made eighty-five total errors and took twenty-six trials to learn the maze.) This very good performance is quite exceptional, and the lowest number of total errors ever seen again was twenty-eight with nine trials to learn in group F (2 months old male rats). In the adult groups the performances of individual rats were more even.

The average number of total errors and the number of trials to [illegible]onds for [illegible]nths old [illegible]al errors [illegible]

[illegible] and [illegible] 2 [illegible] was [illegible]

TABLE I

Age.	Group.	Number of Rats.	Sex.	Age (Months).	Number of Trials to Learn.	Total Errors.	Number of Trials to Time Criterion.
Young .	B	10	♂	2	12·7	54·0	18·2
	F	10	♂	2	17·7	62·0	22·3
	K	10	♀	2	24·0	98·5	16·8
	N	10	♀	3	18·7	71·3	15·5
		40	Average		18·3	71·5	18·2
Adult .	O	10	♀	8	17·9	78·5	18·6
	C	10	♂	9	17·1	70·0	16·2
	DE	13	♂	9½	14·1	57·0	17·2
		33	Average		16·4	68·5	17·3
Old .	LM	13	♀	21	25·2	106·0	25·9
	P	12	♂	22 to 24	22·1	95·3	23·5
		25	Average		23·6	100·7	24·2

were losing body weight slightly. In our rat colony, 21 months is the age level at which 50 per cent. of the rat population have already died, and we consider the survivors to be old (although there may, of course, be considerable differences in biological age between individuals of 21 months).

When tested in the maze, these old rats ran through eagerly in search of food in a way entirely comparable to the younger rats. Some individuals made scores which would be average for young adult rats, *e.g.*, twelve trials to learn and fifty-six total errors, and thirteen trials to learn and fifty-four total errors, but the average for the group—25·9 (see LM in Table I)—is considerably worse than the averages for 2 months old and 9 months old rats (18·3 and 16·4 respectively).

In Fig. 1 a curve is given of the average number of errors in the first five days, second five days, etc., for this group (LM) of old female rats, compared with a group (N) of ten young females 3 months old and (O) of ten female rats 8 months old. It will be seen that while the 3 months and 8 months old groups reduce their number of errors rapidly after the first five days, the 21 months old rats take much longer to reduce their errors to three or under, and do not reach the same low level of 1·2 errors in thirty days.

These old female rats, therefore, learnt more slowly as a group than the young rats. What is perhaps more interesting (in view of the memory test afterwards made on these animals) is the fact that six out of the thirteen rats made scores of more than 130 total errors and did not reach the criterion of learning (or the time criterion) in thirty trials.

Such very poor individual learning performances were found very rarely in young rats, although we have one or two examples in the groups of female rats of 2 months (K) and 8 months (O). We never found such bad learning in young male rats.

A group (P in Table I) of thirteen old male rats of the age of 22 to 27 months were now tested, and their learning scores also gave an average considerably worse, in each criterion, than those of young rats: trials to learn 22·1, total errors 95·3, and trials to reach time criterion 23·5. Fig. 1 shows a curve of the average number of errors for each five days of the trials compared with the averages of [illegible] nths [illegible] rats [illegible] the [illegible] are [illegible] the [illegible] thirty trials. None of the young male rats in any group ever showed such bad learning performances.

Our conclusion for the old rats (male and female) is, therefore, that while seven out of twelve (one in each group died during trials) in each group can learn the maze with scores within the normal range for young adult rats, the other five (42 per cent.) were not able to learn the maze at all.

B. Memory Tests

1. *After forty to fifty-six days' interval*—Memory tests were made with groups of rats which had learnt the maze and were then returned to the stock house for a period of forty to fifty-six days from the end

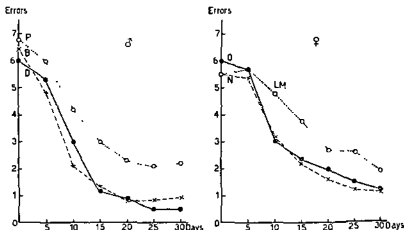


Fig. 1

Learning of young, adult, and old rats compared.

The curves show the average number of errors per trial for each five days for groups of 10 to 13 rats.

♂: B=2 months old rats (10 rats)
D=9 months old rats (13 rats).
P=22 months old to 24 months old rats (13 rats).

♀: N=3 months old rats (10 rats).
O=8 months old rats (10 rats).
LM=21 months old rats (13 rats).

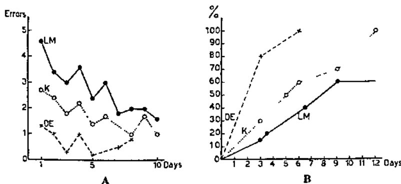
of the thirty days' learning trials. Young groups (K and B in Table II) were now 4½ to 5 months old, and the adult groups (DE and C) were 12 months old, while the old group (LM) were now 23½ months old.

The results of relearning the maze are seen in Table II; they are expressed as the percentage of the group which remembered the maze in the first three to five trials, in the six to nine trials, and in ten or more.

It will be seen that, of the 4 to 5 months old rats (of groups K and B), 50 per cent. remembered the maze in the first three to five trials, while 30 per cent. and 40 per cent. required ten or more trials.

The 12 months old rats in both groups (DE and C) made better relearning scores, 80 per cent. and 70 per cent. respectively remembering the maze in the first three to five trials. The adult rats of 12 months, therefore, remembered the maze better than the 4 months old rats.

The 23½ months old rats of group LM made a very much poorer performance in relearning. Only two animals (16·6 per cent.) remembered the maze in three to five trials, five in six to nine trials, and five did not remember it at all. These five rats (40 per cent. of the group) continued to make scores of five, six, or seven errors a



A B

FIG. 2

Relearning in young, adult, and old rats.

[illegible]

[illegible] per cent.

day and seemed quite incapable of reducing their score, although they showed eagerness to get to the food and always ate very avidly on arrival. It therefore does not seem to be a lack of hunger [illegible] maze,

[illegible] ng [illegible] six [illegible] nt

the maze in three to eight trials continued to make no errors after the excitant. After a twelve-days' pause we again retested the group, and again the five rats which had not learnt in thirteen trials did not relearn it in another seven trials, while the seven rats which had relearnt (of which three had now died) continued to run the maze without error.

TABLE II

MEMORY TESTS: SHORT INTERVAL

Age.	Group.	Number of Rats.	Sex.	Age at Learning (Months).	Age at Relearning (Months).	Interval (Days).	Percentage of Group to Relearn after Trials.		
							3 to 5.	6 to 9.	10 and more.
Young .	K	10	♀	2	4½	40	50·0	20·0	30 0
	B	10	♂	2	5	56	50·0	10·0	40·0
Adult .	DE	13	♂	9½	12	42	80 0	20·0	...
	C	10	♂	9	12	56	70·0	20 0	10·0
Old .	LM	12	♀	21	23½	40	16·6	41·7	41·7

TABLE III

MEMORY TESTS: LONG INTERVAL

Age.	Group.	Number of Rats.	Sex.	Age at Learning (Months).	Age at Relearning (Months).	Interval (Months).	Percentage of Group to Relearn after Trials.		
							3 to 5.	6 to 9.	10 and More.
Young .	F	10	♂	2	8	5	90	10	...
Adult .	DE	13	♂	9½ and 12	17	5	22	22	56
	B	10	♂	2 and 5	14½	9½	22	11	67
Old .	C	10	♂	9 and 12	21½	9½	17	33	50

2. *After five and nine months' intervals*—Memory tests were also made after longer intervals for forgetting: a group of ten young male rats (F) were retested after an interval of five months from the time they finished learning the maze. They were 2 months old when they first learnt the maze and were now relearning it at the age of 8 months. As will be seen in Table III, 90 per cent. of the [illegible] than ten trials.

Simil [illegible] age of I [illegible] of nine [illegible] cent. and 17 per cent. respectively relearnt the maze in the first three to five trials, and 67 per cent. and 50 per cent. respectively took more than ten trials. It seems that memory of the maze is poor in rats of over 14 months, when long intervals (five and nine months) for forgetting are given. The remarkably good memory of the rats 8 months old (group F, Table III) after a period of five months is in striking contrast to the poor memory of the older groups (DE, B, and C).

Very interesting results were seen when a small group of survivors of group DE were retested at the advanced old age of 23 months, [illegible] 17 months (Table III). [illegible] on this third relearning, at the age of 23 months, are given in Table IV.

It will be seen that while four of the six rats relearnt the maze at once in the first three to four trials, two rats (K and KS) had apparently forgotten the maze which they had known earlier in life and were unable to relearn it in ten trials. After an interval of twelve days, during which these rats were subjected to ether anæsthesia on ten days (for certain other tests), the rats continued to repeat their characteristic performance. The three (the fourth having died) which had remembered the maze in the first three trials continued to make not more than an occasional error, while the two rats which had been unable to relearn in the first ten trials, continued to make three to six errors each time they ran the maze.

Here again we believe we have an example of old animals suffering from loss of memory.

Discussion—These experiments, made on ninety-eight rats of a pure strain living under very constant conditions, showed for four groups of ten 2 months old rats, run at different times, and for three groups of ten adult 8 to 9 months old rats (run simultaneously with three of the young groups), that there is no difference in the

TABLE IV

MEMORY TESTS ON 23 MONTHS OLD RATS (AFTER TWO MONTHS' INTERVAL)

Rat No.	Number of Errors per Trial.										After Twelve Days' Interval with Anæsthesia.		
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
K * .	2	5	2	1	5	4	5	4	2	2	6	5	6
KR .	1	0	0	1	0	1	0	1	0	0	0	0	2
KS * .	6	8	7	7	8	7	6	4	7	4	3	4	5
KRS .	2	1	1	0	0	0	0	0	0	0	0	0	0
RS .	3	0	0	0	0	0	1	1	0	2	2	0	1
N .	1	0	0	0	0	1	+	...	...	...	...	...	...

* Rats K and KS were unable to relearn the maze in thirteen trials, although they had learnt it earlier in life.

learning ability of young growing and young adult rats. This is in agreement with the experiments reported by Stone (3). His severely fasted groups of rats of 15 months took 17 trials to learn with 63·8 total errors, as against our 8 to 9 months old rats' 16·4 and 68·5. His 2 months old rats made an average of trials to learn of 13·5 and 62·8 total errors, which is similar to our severely fasted group B of 2 months old rats with 12·7 trials to learn and fifty-four total errors. These averages would show the half-grown 2 months old rats as faster learners than the 9 months old rats, but our other groups of 2 to 3 months old rats learnt more slowly, bringing the total for forty young rats to 18·3 and 71·5 total errors.

The explanation for the differences between our groups of 2 months old rats, B, F, K, and N, may be that the fastest group B were more severely fasted than the others. The group B was the first group tried and they were so restricted in diet that they lost weight for the first five days of preliminary training and the first five days on the maze. In other groups of young growing rats we tried to keep a constant weight for the first fifteen days and then to allow a growth of about 1 gm. a day. This very severe fasting of group B may explain their more rapid performance. Stone quotes figures for less severely fasted groups in which a group of [illegible] 15 total errors,

[illegible] able to obtain [illegible] difficult. We discontinued the severe degree of fasting imposed on group B and group DE in the 9 months old category, as we thought it improbable that the old rats of 21 to 24 months could be brought to experience the same high degree of hunger. We therefore aimed at appetite rather than extreme hunger, and we felt satisfied that the old rats showed as much eagerness to reach the end of the maze and to eat the food on arrival, as did the younger rats.

In an attempt to find a better motivation than hunger, we trained a group of 10 months old rats with sugar solution as reward and no fasting. The rats learnt the maze but their performances were so much inferior to those of the fasted rats that we gave up the use of sugar solution reward.

Our experimental results do not agree with those of Stone in regard to old rats. He quotes an average for severely fasted group of 24 months old rats learning the maze in sixteen trials with only [illegible]

16·4 trials respectively. It seems, therefore, that Stone's group of 2 ye [illegible] ble to le [illegible] a high [illegible] ur strain of rats.

The total inability to remember the maze which had once been learnt, which was seen in about 40 per cent. of each of our groups of old rats, agrees with the observation made by Stone that three out of a group of twenty-eight rats of 2 years of age were found to make three to four times as many errors in relearning as in their original learning series. He states that this behaviour is quite atypical of the relearning performances of all the younger groups, and concludes that it represents a true state of senility in these three old individuals. The fact that Stone saw it in only three out of twenty-eight rats (about 10·7 per cent.), while we found it in 40 per cent. of our old groups, may again be due to a difference in biological age of our strain of rats at 21 to 24 months and that of Stone's rats. In general, therefore, we feel that there is agreement between our results and those of Stone.

The two points which we consider to be most interesting in our experiments are (1) this phenomenon of loss of memory in certain individuals in all groups older than 23 months, and (2) the extent to which the individual performance of each rat is resistant to attempts to influence it. We have tried to quicken the learning of the slower learners in both old and young groups with excitants and with thyroxin injections, but we never found any instance of significant improvement in response to these attempted stimulants. The fact noted that ten complete anæsthesia in twelve days did not influence the characteristic individual performances of the group of old rats shown in Table IV, is also an indication of the very stable nature of the memory of the maze (or in the cases of loss of memory, of the lack of memory of the maze). We intend, nevertheless, to continue our attempts to find factors which will influence, or prevent, this loss of memory in old age.

SUMMARY

Learning and memory tests were made on a total of ninety-eight rats of a pure inbred strain at different ages, in a multiple-T, thirteen-choice point, alley maze, with hunger motivation. The results were :—

1. Young rats 2 to 3 months old (two groups of ten male and two groups of ten female rats) were found to learn at about the same rate as adult rats of 8 to 9 months (two groups of ten male rats and one group of ten female rats).

2. Two groups of old rats 21 to 24 months of age (twenty-six animals) were found to learn considerably less well; 60 per cent. of each group learnt at a rate within the normal range for young rats, while 40 per cent. were unable to learn the maze at all.

3 Memory tests, made by retesting the rats after forty to fifty days, showed that adult rats 12 months of age (two groups of ten male rats) remembered the maze very well, while young rats of 4½ to 5 months (two groups of ten, one female and one male) relearnt somewhat less well.

4. A group of twelve old female rats of 23½ months relearnt the maze after forty to fifty days' interval considerably less well than the younger groups, and five of them were unable to relearn the maze at all in twenty trials.

5. After longer intervals, of five and nine months, it was found that a group of rats 8 months old remembered the maze almost perfectly, while in groups of older rats, of 14, 17, and 21 months, only 20 per cent. of the rats remembered the maze at once and over 50 per cent. could not relearn it in ten trials.

The author suggests that these repeated instances of lack of ability of *some* of the old rats to relearn the maze which they had learnt earlier in life represent true loss of memory in old age. This experimental demonstration of loss of memory in old age would seem to provide a method for the investigation of factors which may influence this disability of old age.

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KAY, H., Oxford. *Some experiments on adult learning.*

PSYCHOLOGISTS have long been fascinated by the problem of how quickly and satisfactorily an older person can adapt to a new situation. The efficiency or otherwise of such learning may have practical and social importance, but it is as well to be clear at the outset of its relative unimportance to the individual. It is much more [illegible]

any new situation with which he is confronted.

I am trying in this paper to put the subject of learning in the context of the general activities which might be expected from an adult biological mechanism. The experiments illustrate how an [illegible]

same in all the experiments. A subject sat in front of two boxes, both 2 ft. long and 2 in. high. There was a row of twelve lights [illegible]

remember it, and to go on and find the "correct" key for the next serial position. The task was chosen because it seemed a sufficiently interesting operation to ask adults to undertake, whilst its difficulty could easily be controlled by varying the length of the series to be learned.

One of the first experime[illegible] of age groups from 20 to 70 [illegible] and subsequently when they [illegible] have already been reported ([illegible] showed that from about 30 years [illegible]

[illegible]

made, therefore, within the framework [illegible] a series of conditions so as to study if subjects of different ages were setting themselves different criteria and whether such criteria [illegible] conditions of the experiment changed.

[illegible] sks: in the first—Task A—the [illegible] ly above the keys and the electrical connections were arranged so that a subject had only to press the key directly in line with the light to change it to another position. The procedure was repeated for thirty "moves," all of which could be completed in less than half a minute. It was a new but simple operation for subjects, who were left to carry it out at whatever tempo they wished.

For the sixty-four subjects representing age ranges from 15 to 72 years it was found that there was a small but decided trend for t[illegible] groups to take longer (see Table I).

[illegible] the light display [illegible] p between [illegible] alteration [illegible] g subjects [illegible] e, [illegible] re [illegible] d [illegible] one in the 15 to 24 years gro[illegible] re considered separately, older subjects performed worse in [illegible] ey t[illegible] and better in so far as they were more accurate. [illegible] scores: from an [illegible] cts have sacrificed [illegible] s 25 to 44 years [illegible] between doing the

TABLE I

TIMES AND ERRORS FOR THE THREE TASKS, A, B, AND C

Age Group.	Task A.		Task B.		Task C.	
	Means.	S.D.	Means.	S.D.	Means.	S.D
			TIMES			
15 to 24 .	22·8	1·30	38·4	6 08	75·9	21·19
25 to 34 .	23·9	2·53	37·7	6 48	86·5	20 00
35 to 44 .	23·4	3·28	38·6	11 05	76 6	31 22
45 to 54 .	24·3	3·16	37·6	7 00	85 9	23 22
55 to 64 .	25·5	3·35	44 8	7 61	92 9	22·00
65 to 72	26·9	3·63	47·5	11 05	126 7	42·13
			ERRORS			
15 to 24 .	Nil	Nil	5 5	3·06	9·1	4·72
25 to 34 .	Nil	Nil	4 2	2 24	10 1	5·65
35 to 44 .	Nil	Nil	3·9	2·34	8·3	2 49
45 to 54 .	Nil	Nil	4·5	2·50	10·6	3·97
55 to 64 .	Nil	Nil	3·5	2·71	7·8	3·20
65 to 72 .	*Nil*	*Nil*	2·4	2 64	*8·2*	3·33

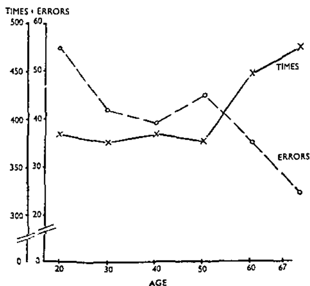


FIG. 1
Times and errors for Task B.

task quickly and not making too many mistakes. The youngest group paid scant regard to mistakes and tried to be as quick as possible. To some extent this defeated its own end, since this led them into making errors, thereby lengthening their total performance times.

So far both tasks were well within the capabilities of all age groups, but the next operation—Task C—increased the difficulty by rotating the row of lights through 180 degrees in the vertical plane, thus reversing the direct light-key relationship. At this task every subject made some mistakes, but though there was no clear-cut trend in the error distribution the two oldest groups scored slightly

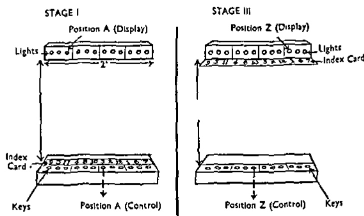


Fig. 2

Positions of the light-key apparatus and index card at Stages I and III.

less errors than any of the other groups. On the other hand their times were correspondingly greater.

If we compare the results for the three tasks we find that older subjects took significantly longer even on the simplest—Task A—and as the tasks became more difficult their proportional increase was greater than that of the younger subjects. Their emphasis was obvi[illegible] possible, and [illegible] difficult they [illegible] gave the more [illegible] on both Tasks B and C accuracy was being sacrificed to speed, whilst the intermediate age groups showed an interesting adjustment between the two criteria—the 50's, for example, on Task B were a little quicker but made slightly more errors than the 40's, who in their turn took slightly longer and made slightly fewer mistakes than the 30's.

These were not [illegible] to be accurate of the old [illegible] this habit is with them. [illegible] ment where the procedu[illegible] jects to have to think carefully about it.

experiment:—

1. Think of the lights as being numbered 1 to 12 from the left.
2. When a light comes on decide which number it is.
3. Find that number on the card.
4. The correct key to hit is the key in line with the number on the card.

At each of the three stages subjects had to make twenty correct responses. This might be thought of as twenty separate problems all involving an identical procedure—thus there was ample opportunity to learn if a subject did make mistakes.

The number of mistakes are presented graphically in Fig. 3; the results were similar for the times taken to complete the tasks. It will be seen that the operation was not difficult at Stage I and was carried out with reasonable efficiency by all subjects, though even so older subjects were making more than twice as many mistakes and taking one and a half times as long as the younger. But by Stage III it was obvious both from how subjects undertook the task and from their results that the operation was now radically more difficult. All subjects, and particularly older subjects, were making a number of mistakes at several positions.

If we consider this as an example of how different age groups think out how to follow the procedural instructions for a task, then the older were less satisfactory than the younger, and as the difficulty of the task increased the more marked became the discrepancy between the age ranges. This illustrates an old point sometimes forgotten in experiments with older people—that the relative performances of different groups often varies considerably as the difficulty of a task is raised. This point would invalidate some of the generalisations which have been made from experiments where tasks representing only one level of difficulty were presented.

ults, has
It will
e always
ex card,

which was moved from a position beside the keys at Stage I to beside the lights at Stage III. It is an easy mental operation when given three units to associate the two which are spatially adjacent, and this was the task at Stage I—the index card numbers referred to the keys positioned near to them, not to the more distant lights. But it is considerably more difficult to ignore the relation of the two adjacent units and to associate those two of the three which are

remote from one another. This was the task at Stage III—the card number spaced next to the lights referred not to them but to the keys. As we noted, a subject had to make twenty correct responses at each stage. When he was able to follow through the instructed procedure he, of course, pressed the correct key, but when he became

the spatial contiguity of the card and the lights was influencing a subject then particular types of error responses could be predicted.

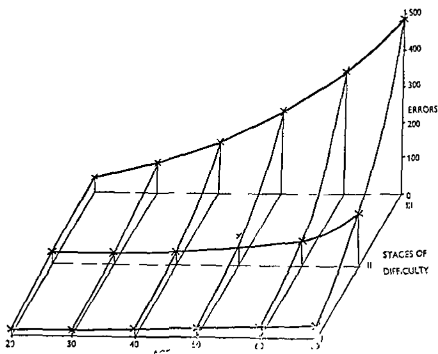


Fig. 3
Relation between age, total errors, and degree of difficulty.

When a subject lined up the light with the number immediately underneath it, he would then either go on to press the key whose spatial position corresponded with that number, or he would hit the key in line with the number (which, in fact, nullifies the use of the card). Such errors did, in fact, occur—of the total errors the majority were not random but were of the two predicted types, and their occurrence was taken as indicating how a subject had been erroneously influenced in his thinking and the steps by which he had arrived at his wrong conclusion. As an example of the frequency of these mistakes, in the over 65 years group errors were made on the average at thirteen of the twenty serial positions, and at least

one of the two predicted types of errors was repeated at each of these thirteen positions.

The failure, then, is mainly to be ascribed to this inability to discard an unprofitable line of thinking about the problem. It was not that a subject's progress was barred by blankness—by an inability to remember what he had to do—but rather that he was too persistent in retaining a wrong procedure based on acquired mental habits. For the very reason that an adult has found that certain features of

of experience.

We might consider this as follows: A complex biological mechanism is capable of adapting itself to meet the probabilities of events—a form of experience—but by very reason of the fact that this makes for ease of maintaining performance it also makes the organism less well equipped when the improbabilities occur. Many *modern machine designers think it worth copying this human failing.* For example, on our present telephone systems every number has an equal *probability on everybody's telephone,* but *many numbers* are used infrequently. It would speed up the system if the exchange

people, and particularly about their co-operative behaviour in psychological experiments. It has been my experience that though it may be more difficult to persuade them to enter an unfamiliar experimental situation, once they have agreed to participate they try at least as much, if not more, than younger subjects, whilst their sense of competition with other age ranges is certainly more highly developed.

" Particularly difficult to separate are the concomitant variations in motivation . . . and true changes in learning ability *per se*. The disentanglement of these factors is a genuine challenge " (p. 633). I think this, if not confused, to be at least framing the problem wrongly. It treats motivation as if it were a kind of factor which might or might not be brought into action in any given situation and which might diminish or augment another factor, " learning [illegible]

[illegible] 1930; Miles, 1935) that practice in learning will help to maintain that ability and lack of practice will contribute to its decline. We need, therefore, to ask how far will a prevailing lack of motivation [illegible]

[illegible] decline in learning, and so on. Put concretely, how far does a disinclination to attempt a particular type of operation, when held over a long period of time, eventually cause a genuine inability in that field. Thus the organism which in the past through a lack of motivation discontinued a particular activity may well be facing a present situation with a very definite inability in that field. And if we ask of that present situation, " How far could an increase in motivation raise a performance to its previous level ? " the answer would seem fairly definite that it could not.

Closely linked with this desire to separate the variations in motivation and in learning ability is a similar endeavour to distinguish [illegible]

[illegible] task *ab initio* so much as how it differs from an already acquired one. He learns by relating, and as we have seen, sometimes these relations are not applicable. Psychologists, rightly occupied with studying how much individuals differ in their learning, have been preoccupied with identifying some fixed quality which is subjected to various [illegible]

[illegible] that by " boosting " motivation we could put the organism back where it was with its initial and unalterable ability. This seems to be a fallacy based upon the wrong kind of model. We are considering a system which is capable of coping with the natural developmental

processes of a biological organism—this requires us to accept that not only does such a mechanism carry its past around with it but that it represents a closely linked unitary system. The present argument is a plea for recognising that an individual has not only different learning abilities for different fields but that they are undergoing modification with his continued experience; it would recognise that his interests and activities will have played their part in modifying a particular ability, but it would not attempt to "unscramble" the interaction.

It has been stressed how an adult is at a disadvantage in adapting to a new situation where previous experience is not applicable. But the converse does follow—there is a considerable gain in a situation where that experience is relevant, and as was mentioned at the beginning of this paper, in the everyday business of life this is a more prevalent occurrence and therefore a more useful attribute to the individual. For the purpose of this paper we have not been considering this maintenance of performance but its acquisition. And the adult's deficiencies here primarily arise, not because any retaining mechanism is functioning inadequately but, rather the reverse, it is holding on too indelibly to what it already holds and is not sufficiently flexible to cope with new data. It would seem that in introducing an adult into a novel situation there should be an accent upon familiar features, whilst ensuring that the unfamiliar are seen as such; subsequent training can leave the old habits to take care of themselves and devote itself exclusively to acquiring the new.

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JONES, H. E., California. *Age changes in adult mental abilities.*

The study of age changes in human abilities has a scientific history of hardly more than twenty years. To be sure, we owe a debt to the pioneer work of Sir Francis Galton, and one might also refer to that even earlier writer who presented the concept of the seven ages of man. But we are concerned here with gradients rather than with age typing, and, as compared with Galton, with complex traits rather than the simpler perceptual and motor functions represented in his studies.

However, when we are discussing the abilities measured by mental

tests, we must of course recognise that there are many unmeasured factors which are important in general mental performance and achievement. I am not here discussing these other factors which are especially relevant to age comparisons—habits of work, levels of purpose and aspiration, experienced judgment, emotional control, and the like—but only the mental aptitudes which can be measured in a standard intelligence test. Moreover, the descriptive curves to be presented here are of a somewhat primitive scientific order; since it cannot be claimed that they are based on equal units, only a very limited mathematical analysis is possible.

Some two decades ago I published a monograph (3) with H. S. Conrad, *which was one of a series of reports dealing with the growth* and decline of mental abilities. The Army Alpha, one of the earliest [illegible] as a measure of general [illegible] d on about 1,200 cases [illegible] to about sixteen years, [illegible] peak between the ages [illegible] as much more gradual than the curve of growth, but which, by the age of 55, involved a recession to about the fourteen-year level.

These findings have in general been supported by other tests on other samples, so that in a summary report in 1951 Shock (6) was able to state: "There can be no doubt that the average scores attained on intelligence tests diminish with increasing age."

Within the last year, however, three reports have been published which imply a different conclusion. One of these, by William Owens (5) of Iowa State College, is particularly pertinent because *he used the same test as in my study*, and *in a retest of cases first* measured at around age 19 found some thirty years later not a decline but a significant increase in total score. His increase, about half a [illegible]

The first point to be noted is that whereas Owens dealt with college graduates, our subjects represented a cross-section with an average schooling of only about ten years. Owens, moreover, was restricted to cases sufficiently co-operative to take retests, partly on the basis of contacts through correspondence.

Fig. 1 shows the smoothed form of the age curve for 381 cases in my first sample tested in a rural part of central New England, and for 810 cases in a second sample tested a year later in a different section of New England. Both were from relatively stable old American populations chiefly engaged in farming or small village occupations. There are no significant differences between these two curves, although in the second sample a slightly higher peak is reached at age 20,

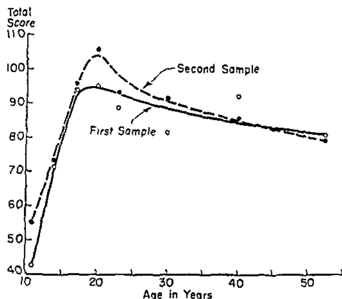


FIG. 1

The distributions of younger and older subjects are compared in Fig. 2. The difference in means is highly significant, but it should be noted that more than one-third (36·7 per cent.) of the older group

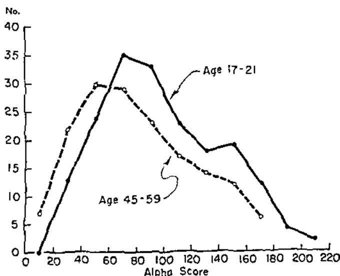


FIG. 2

exceed the median of the younger; and 12·4 per cent. exceed the third quartile.

In 1953 Corsini and Fassett (2) criticised our findings on the ground of a probable sampling bias against older persons. It can be shown, however, that in those parts of our study in which bias was present it tended to be *in favour* of older persons.

In mental test surveys, rural districts provide all the tactical advantages of an open terrain; the families are easily discovered, and their defences probed by individual methods. Our sampling procedure involved a campaign of group testing, after which the

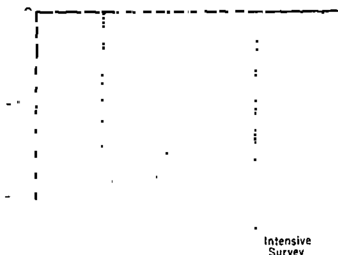


FIG. 3

examiners deployed in skirmish formation and covered individual homes. The group tests were given as an adjunct to free motion-picture programmes; incentives for the individual tests were developed not merely on a personal basis but also by offering a cash payment for each complete family tested—to be given either to the family or to a community fund. Our aim was to obtain a fair sample not only of adults but also of children, since the most satisfactory method of portraying ability changes among adults would appear to be in relation to the rise of intelligence among comparable groups of adolescents.

This is brought out, for example, in Fig. 3, which compares results from a general sample of fourteen communities, with a more intensive survey of five communities, in which much time was devoted to searching out and testing all available cases within the whole age range. The decrement, from age 20 to age 45 to 59, is expressed in terms of the standard deviation at age 20. The more

marked decline is in the more intensive survey; and perhaps this should be expected, for the older, duller individuals are often difficult to draw into a test programme without special devices to motivate them.

As a further answer to Corsini and Fassett several other checks on our sample are possible. Fig. 4 compares the score distributions of a younger and an older group taken from a parent-child sub-sample in which fifty-five parents were tested and eighty-seven of their children 11 years of age or older, including all family members falling within the age range of our test. This comparison is based on six sub-tests of the Army Alpha, omitting two tests (vocabulary

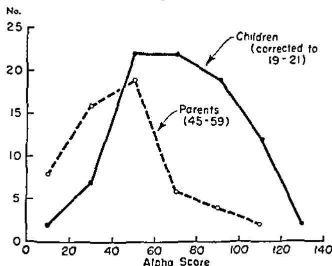


FIG. 4

and general information) which can be shown to be less valid for age comparisons. For children younger than 19 years, raw scores have been corrected to the score levels predicted, in each case, for the end of the growth period.*

In these two groups, which are genetically comparable—and

* Raw scores were transformed into standard scores at each age level and converted back into raw scores through the standard score table for ages 19 to 21.

ascribed to speed factors (4) handicapping older persons, to visual and auditory handicaps, and to reduced motivation or lack of interest in the artificial tasks of a mental test situation.

One approach to this problem is through comparing the performance of the same individuals on different tests. It would be instructive to do this in terms of primary abilities based on factor studies, but as yet we do not have the data for this and must be content with comparing different sub-tests, each made up of its own characteristic and homogeneous items.

Fig. 5 shows for 1,191 cases the age curves on eight sub-test functions. In this chart, raw data have been transformed into

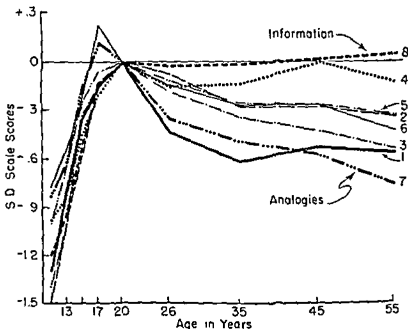


Fig. 5

comparable measures by taking the performance in the age group 19 to 21 as a reference point, and for each earlier and later age computing the score difference in terms of the standard deviation of the reference group. On this basis, it is evident that during the growth period the various functions represented here grow at similar rates. But after the peak is reached, usually at around age 20, a greater differential, or fanning out, becomes apparent. The most marked contrast is between Test 7 (Analogies) and Test 8 (General Information).

To pursue this further, I have made a comparison of these two tests in terms of the number of items *attempted*, without regard to correctness. The tests have the same number of items (forty) and

are comparable in administration and reading difficulty. If Test 7

are attempted on the Analogies test. Since we cannot interpret this as due to a superficial or psychometric handicap, we must conclude that the change with age lies in the intrinsic difficulty of the items. They become, with age, harder to solve, and fewer can be attempted.

Of those which are attempted, a decreasing proportion are answered correctly in the Analogies test and an increasing proportion

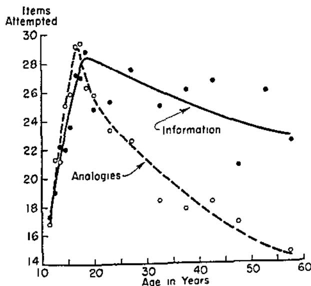


FIG. 6

I interpret these findings as indicating that the age pattern difference between the two tests is due to the tendency for Test 8 (General Information) to reflect the mere accumulation of verbal or f

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going, thereafter, on whatever fizz we have experienced them.

Time is lacking here to consider ways in which I have examined,

without altering earlier conclusions, the factor of adult incentive and the possible role of sensory handicap in later years. It may be sufficient to say that even with the best control of test conditions, in individual tests, a significant decline is recorded, not accounted for by factors of speed, vision, or hearing.

But we should note that these results do not apply to the years beyond 60, in which apparent decline may be steeper but perhaps less readily taken at face value and less properly measured by our standard tests. Nor do they apply to such samples as Owens' college

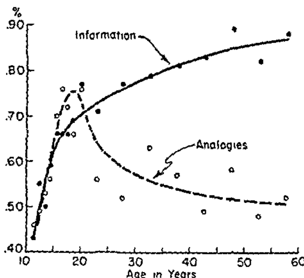


Fig. 7

graduates or Bayley's (1) gifted adults. In this top 10 per cent. of

delayed in some functions than in others. But it is a fact of some significance that the age change tends to be greater in those tests which more directly show not the effects of earlier learning but the functioning of current abilities.

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WECHSLER, D., New York. *The measurement and evaluation of intelligence of older persons.*

In discussing the changes of performance in relation to age, I shall

problems, both intrinsic and extrinsic. Under the extrinsic

and all of which factors tend to impair the representativeness of the population studied. Among the intrinsic problems there is, first,

met there still remains the question whether an identical test,

not equally effective. The question then arises what are we measuring when we measure intelligence in terms of success or failure in any given performance. I cannot at this time go into this complex and basic problem. I have merely brought it up to indicate that I am not unaware of the difficulties which comparisons of performance at different ages present. My own view, briefly, is that not only do human abilities change with age but that the significances of the abilities themselves are altered at different ages. Indeed, they are not only altered with age but also with different levels of function at the same age levels. Practically, this means that at different age levels we may be dealing with different psychological parameters although employing the same test materials and obtaining similar kinds of response. If this is so it would seem that we ought to have

With these considerations in mind one can briefly summarise the findings regarding the changes of intelligence test scores with age. Intellectual ability as we measure it follows very closely the curve of growth and decline observed in other human traits of ability. It is a logistic curve which begins to level off in most instances at about age 15. From this age on test scores show negligible increments with age until a maximum is reached in the age interval 20 to 25. Beyond this age all test scores begin to decline. The decline at first is relatively slow, but after 35 becomes increasingly apparent. The decline is continuous for most abilities and by age 60 amounts, on the average, to a drop of about 25 per cent. in test score. Some test scores decline more than others; thus the drop in Vocabulary and Information is relatively small, whereas the loss in rote memory (Digit Span) and Block Design is considerable; but [illegible] e in terms of measured abilities taken singly or in combination, one must conclude that intelligence like other abilities declines with age. Two strictures are possible in rebuttal to this unpleasant conclusion. One has already been indicated, namely, that intelligence tests, such as they are, do not measure the same kind of intelligence in old people or in the same sort of way as they do at other age levels. I shall return to this point shortly. The second stricture, and one which has been emphasised by Professor Irving Lorge, is that the tests we now use unduly penalise older adults, because they are so heavily weighted for speed. Professor Lorge sought to demonstrate this point by giving subjects whose ages ranged from below 20 to over 70 two different types of tests, the Army Alpha [illegible] Thorndike [illegible] to take as long as they wished to finish. Professor Lorge found that [illegible] apart from the indicated selected character of the subjects was that no attempt was made to reverse the conditions of the experiment, in an effort to see what would happen to the scores of the older subjects on the non-timed tests if the scores on the timed tests had been kept constant. I believe that if this had been done one could have found that the older subjects continued to fare almost as poorly on the non-timed test.

More recent data available from the current restandardisation of the Wechsler Intelligence Scale for Adults has made possible a more direct attack on the problem of the influence of time on

intelligence test performance of older subjects. As part of our standardisation, opportunity was afforded us to examine a cross-sectional segment of the older population of Kansas City, in conjunction with a study which was being conducted by the Chicago University Committee investigating the ageing problem in its various aspects. The subjects consisted of random samples * of the older population of Kansas City, ages 60 and over, to whom the revised Wechsler Adult Scale was administered in two ways, one in which the subjects were allowed fixed times to complete the task assigned and another in which the subjects continued with the items until they said they were finished or indicated they could do no more. This permitted us to obtain two scores for each subject and to compare the differences in score on the same tests when timed and when not timed.

The results are shown in Table I. The average increment in raw score per test when subjects were allowed unlimited time was only about 5 per cent., and the ratio between the mean differences of the compared test scores and the standard deviation of these differences never exceeded a critical ratio of 0·92. This is a difference in level of performance considerably less than what would be expected from chance variations at the 1 per cent. level of confidence. The differences between timed and untimed performances of the other age groups tested (not shown in table) were of the same order. Altogether, our findings show that the older subjects were negligibly, if at all, penalised by a speed factor, at

With regard to the first point, the evidence is increasingly clear that the concept of general intelligence is a multi-variate construct, the differentiæ of which alter with successive periods of the individual's life span. In the case of older people it seems that the thing we wish most to include under the term " intelligence " is what William James long ago referred to as sagacity, and which may

Sagacity in older persons, even less than intelligence in younger persons, is not identical with intellectual ability and certainly not a

* The sampling was accomplished as follows: The entire city was mapped

and 75 and over.

substitute for it. There are many highly intelligent people who lack wisdom and many wise people who are limited in intellectual endowment. The problem again comes down to what we want to accept as a definition of general intelligence. As mentioned above, I do not think it is possible to define it by a single continuous concept, that is, one that holds for the entire span of human life, because life itself is only continuous in a chronological sense. One cannot predict "the justice in fair round belly with good capon lined" from "the infant, mewling and puking in the nurse's arms," nor even from "the soldier full of strange oaths and

TABLE I

EFFECT OF INCREASING TIME ALLOWANCE ON SCORES OF THE FIVE TIMED TESTS OF THE W.A.I.S. (KANSAS CITY OLD-AGE STUDY)

Subject of Test.	Age Group.	Normal.	Males.				Ratio.	CR.*
			Timed.		Untimed.			
			Mean.	Standard Deviation.	Mean.	Standard Deviation.		
			Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Arithmetic .	60 to 64	52	10·13	2·91	10·27	2·85	0·98	0·28
	70 to 74	51	8·78	3·25	8·96	3·22	0·99	0·32
Picture completion	60 to 64	50	9·50	3·98	9·82	3·97	0·98	0·40
	70 to 74	47	8·88	4·86	9·18	4·73	0·99	0·29
Block design .	60 to 64	46	23·43	10·21	25·57	10·64	0·96	0·72
	70 to 74	44	18·77	9·30	21·18	9·21	0·96	0·92
Picture arrangement	60 to 64	45	16·10	5·78	16·72	6·11	0·96	0·36
	70 to 74	41	14·16	5·86	14·65	6·13	0·97	0·33
Object assembly	60 to 64	46	22·72	7·88	23·28	7·68	0·97	0·24
	70 to 74	40	19·55	8·26	20·55	8·43	0·98	0·59

$$^{*}CR_{\sigma}=\frac{M_2-M_1}{\sqrt{\sigma_{M_1}+\sigma_{M_2}-2r\sigma_1\sigma_2}}.$$

bearded like a pard." Special ability, intelligence, and wisdom are not identical and we cannot always measure one in terms of the other.

To sum up, sheer ability of all kinds, intellectual included, certainly declines with age. In so far as measures of these abilities are used as measures of intelligence, they force us to the conclusion that intelligence declines with age and, furthermore, that this decline is not due to any time factor penalty. There remains, however, the question of whether there is not an added aspect of intelligence in [illegible] nely, [illegible] ell as [illegible] rism, [illegible] *savait*, with the more encouraging adage, *Vieillesse peut, par ce qu'elle sait.*

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PACAUD, SUZANNE, Paris. *Experimental research on the ageing of psychological functions.*

WE are in daily contact with old age, but we almost entirely ignore everything which concerns the process of ageing in a psychological sense. The problem of declining aptitudes with age has hitherto [illegible]

vention of premature ageing, there is a need for psychologists to give them, in the same way as medical workers, precise information in answer to the question, "In what manner do we age?" This is the task to which the studies reported here are addressed.

These studies fall into two parts. The first is concerned with age changes in memory, intellectual and psychomotor functions; the second examines the effect of education upon the decline of these functions.

Test results were obtained from some 4,000 subjects made up [illegible] training schools [illegible] operatives of [illegible] to 55. They [illegible] itions at the Laboratoire de Psychotechnique de la Société Nationale de Chemins de Fer Francais.

The test results revealed definite changes of aptitude with age, of a magnitude such that they were clearly shown between age groups five years apart. The course of change differed between different functions. Thus in some of the memory tests decline was progressive from the youngest age group studied, while in tests of other aptitudes [illegible]

of aptitude is especially rapid, although in some tests there were [illegible]

reasoning. In tests of psychomotor function it came some five to ten years later.

Some decline with age has been found in all the functions studied. Its magnitude appears to be greatest in those functions

most susceptible to influence by education and social training—especially memory and learning. It is usually less marked among the best 20 per cent. of subjects than among those of average or below-average ability.

Results of tests illustrating these points are shown in Figs. 1 to 10.

Effects of education—It has often been held by previous workers that aptitudes are developed and become "capacities" by the operation of family and other social influences and especially as the result of school training. It is extremely difficult to assess the effects of family or social influences, but conditions in the present study were unusually favourable for assessing the effects of training. The subjects were all very similar as regards social background, occupational category, and type of education. Each age group was divided into two sub-groups: one, labelled C E, containing those who had obtained the Certificat d'Etudes, and one, labelled I P (Instruction Primaire), who had not.

The effects of education upon performance at the tests could be divided into three classes. In the tests of intellectual, memory, and learning functions the difference between the educational levels is [illegible]

tests is small in all age groups (Fig. 13). In no test did a small difference between educational levels among the young subjects go with a large difference among the older.

NOTE ON THE CONSTRUCTION OF THE FIGURES

Deciles of the distribution of the subjects in each group are plotted on the abcissa. Scores in the tests are plotted on the ordinate. The curves are formed by joining the scores for successive deciles of each group of subjects. Thus the best 10 per cent. of the subjects in each age group are plotted in the interdecile between the left-hand side of the graph and the first decile, the next best 10 per cent. in the next decile, and so on. This procedure follows that of Ed. Claparède.

The numbers of subjects in the age groups varied from 100 to over 1,000.

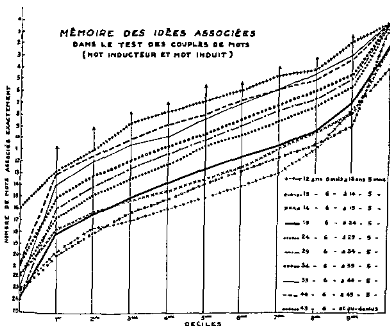


FIG. 1

Recall of paired associates.

MÉMOIRE IMMÉDIATE DES CHIFFRES
dite "CAPACITÉ D'APPRÉHENSION"

NOMBRE DE CHIFFRES RETENUS

DÉCILES

FIG. 2

PRÉCISION D'EXÉCUTION
DANS UN TEST D'ATTENTION CONCENTRÉE
(TEST DE BARRAGE DES SIGNES)

COEFFICIENT DE PRÉCISION

DÉCILES

FIG. 3

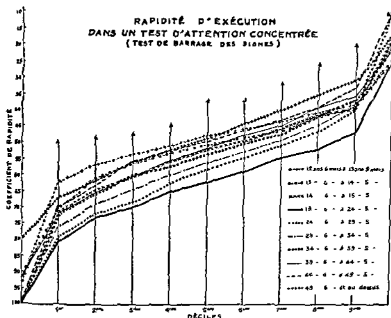


FIG. 4

Fig. 2

Immediate memory span for digits.

[illegible]

Fig. 3

Accuracy in a test of concentrated attention.

The curves from the second to the eighth deciles fall into two families—the *teens and 20's as opposed to the 30's and beyond.*

Fig. 4

[illegible]

RAISONNEMENT
TEST DIT D'INTELLIGENCE LOGIQUE

NOMBRE DE RÉPONSES CORRECTES

12 ans 6 m à 13 ans 5 m
13 . 6 . 14 . 5 .
14 . 6 . 15 . 5 .
19 . 6 . 24 . 5 .
24 . 6 . 29 . 5 .
29 . 6 . 34 . 5 .
34 . 6 . 39 . 5 .
39 . 6 . 44 . 5 .
44 . 6 . et au dessus

1er 2ème 3ème 4ème 5ème 6ème 7ème 8ème 9ème

DECILES

FIG. 5

AJUSTEMENT DE MOUVEMENTS SIMPLES
A UNE CADENCE RAPIDE

NOMBRE DE TROUS POINTES

12 ans 6 m à 13 ans 5 m
13 . 6 . 14 . 5 .
14 . 6 . 15 . 5 .
19 . 6 . 24 . 5 .
24 . 6 . 29 5
29 . 6 . 34 5
34 . 6 . 39 5
39 . 6 . 44 5
44 . 6 . et au dessus

1er 2ème 3ème 4ème 5ème 6ème 7ème 8ème 9ème

DECILES

FIG. 6

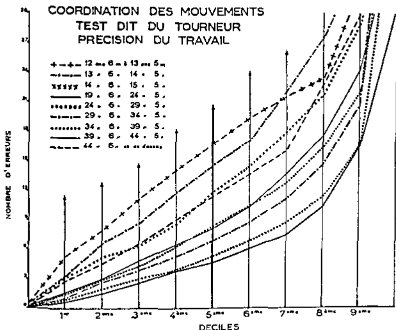


FIG. 7

Fig. 5

Correct responses in a test of reasoning.

There is a fairly steady decline with age from the teens onwards, except that the curve for the early 20's shows the best members of this group to be superior to the best in all others.

Fig. 6

" Hits " in a paced dotting task.

The youngest subjects are the worst performers. There is a sharp rise with age until the 20's, and thereafter a slower decline.

Fig. 7

Numbers of errors in a co-ordination test.

The younger subjects are the least accurate. There is a rapid fall in errors to the early 20's, and thereafter a gradual rise until the subjects over 44½ are about equal in performance to those of 14½ to 15½. Similar results were obtained for duration of errors.

COORDINATION DES MOUVEMENTS
TEST DIT DU TOURNEUR
RAPIDITE DU TRAVAIL

12 ans 6 m à 13 ans 5 m
13 . 6 . 14 . 5 .
14 . 6 . 15 . 5 .
19 . 6 . 24 . 5 .
24 . 6 . 29 . 5 .
29 . 6 . 34 . 5 .
34 . 6 . 39 . 5 .
39 . 6 . 44 . 5 .
44 . 6 . et au dessus

TEMPS D'EXECUTION

1er 2ème 3ème 4ème 5ème 6ème 7ème 8ème 9ème

DECILES

FIG. 8

EXACTITUDE DES RÉACTIONS PSYCHOMOTRICES
AUX STIMULI VISUELS ET AUDITIFS
DANS LE TEST D ATTENTION DIFFUSÉE

COEFFICIENT D EXACTITUDE

DÉCILES

FIG. 9

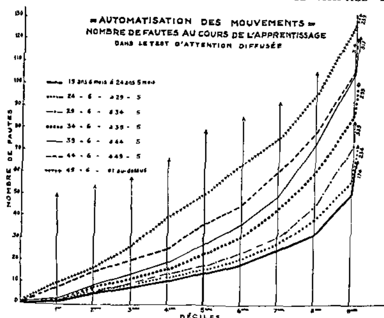


FIG. 10

Fig. 8

Speed of work at a co-ordination test.

There is a rapid rise from the 12½ to 13½ to the 14½ to 15½ group followed by a slow rise to the 20's and early 30's and a rapid fall from the late 30's through the 40's.

Fig. 9

Accuracy of psychomotor reactions to visual and auditory stimuli in a test involving divided attention.

The subject was required to:—

1. Press with the left foot on seeing a red light.
2. Raise the right foot on seeing a green light.
3. Make both movements on seeing a yellow light.

Fig. 10

Errors during learning the test of divided attention.

There is a very substantial increase of errors especially after the early 30's.

RAPIDITE D'EXECUTION
DANS UN TEST D'ATTENTION CONCENTREE
(TEST DE BARRAGE DE SIGNES)

COEFFICIENT DE RAPIDITE

1er 2ème 3ème 4ème 5ème 6ème 7ème 8ème 9ème

DECILES

FIG. 11

MEMOIRE D'EVOCATION D'UN RECIT

NOMBRE D'ELEMENTS EXACTEMENT EVOQUES

1er 2ème 3ème 4ème 5ème 6ème 7ème 8ème 9ème

DECILES

FIG. 12

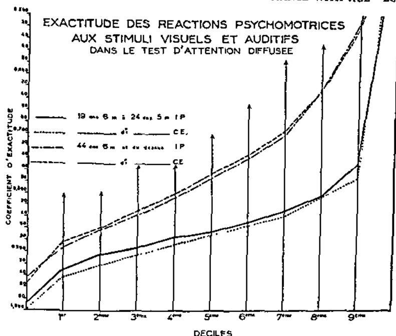


FIG. 13

Fig. 11

Differences with level of education in speed in a test of concentrated attention.

The differences in the early 20's are approximately the same as those among the subjects over 44½.

Fig. 12

Differences with level of education in recall of a passage.

A large difference among the younger subjects is reduced among the older.

Fig. 13

Differences with level of education in accuracy of psychomotor reactions to visual and auditory stimuli in a test involving divided attention.

The differences among both the younger and older subjects are very small.

CHAPTER IX

EMPLOYMENT OF OLDER WORKERS

ABRAMS, A. J., New York. *Discrimination against older workers in various countries.*

In this paper we should like briefly to present for consideration several hypotheses based on our studies of discrimination. We hope they may lead to better understanding of the nature of the discrimination and therefore to effective pragmatic steps of national policy to enable older workers to achieve parity of opportunity based on ability, not birthdays.

Status theory—The aged have enjoyed equality of opportunity in the labour markets only under two circumstances in world history:—

1. When he was *needed* by or *useful* to the family, tribe, community, or industry, as in the guild system wherein he possessed the tools and skill of production.
2. When religious, mystical, or magical sanctions were invoked in his behalf, as under the religion of Buddhism or in cultures of primitives where medicine-men were oldsters and protected age.

A third factor has arisen during the past few years:—

3. When age seeks parity as an "ethic" of human relationship stemming from the rise of democratic equalitarian concepts, and aims to attain acceptance of the doctrine that the "dignity of man" embraces, realistically, man regardless of race, colour, creed, *or age*.

The history of civilisation has been that of unending conflict

its control over the tools of production. The transition from

Psycho-economic factors in current discrimination—A significant study by Dr Irving Lorge and Dr Jacob Tuckman and myself of attitudes of school children in junior and senior high schools of a typical American community shows that these youngsters, ages 12 to 19, already are infected with culture-borne negative attitudes toward old age (1). This study follows others by Lorge and Tuckman showing that college students and graduate students are
Another study
istrial managers
workers, and are

also filled with common stereotypes about them. Union leaders, they found, feel older workers are capable workers and are also victimised by prejudices of their own about older workers. Only social workers and government officials tended to view older workers in terms of individual differences.

rvice place-
the culture
spite broad

policy laid down by boards of directors of companies or public agencies, personnel managers and employment service personnel in day-to-day relationships tend to set up bars for older workers. Oldsters themselves tend to accept the community's image of older workers.

A brilliant case analysis of a plant in the midst of war-time labour shortage which retained its age barriers against women over 45 shows that "exhortation" and "proof" presented by the plant psychologist of the need for hiring such a labour resource were without result (3).
top management to
made in company p
to examine personally the worthiness of older women was the new policy effectuated.

At present we appear to be in a period of transition in so far as the attitudes of older workers themselves are concerned. In work-geared cultures, such as the United States, where Puritanism left its imprint through the years, leisure is still among many older persons deemed to be a sin and work is deemed the end-purpose of man. On the other hand the new leisure which technology is developing and the new pension systems are altering this view. So to-day there is an ambivalent feeling. Many have set up retirement, and early retirement, as a life goal; others, particularly those of retirement age, seek to die with their work-gloves on.

An interesting attack on the problem of older workers as having characteristics of a quasi-minority group has been made by Professor Milton Barron of Cornell University. This approach, suggesting that the experiences in other fields in changing culture-borne attitudes toward the negroes, religious minorities, or other under-privileged groups in our cultures, might well be examined in efforts to alter attitudes towards older workers (4).

There is evidence that stereotypes about older workers among employers are common to employers throughout the world—older
workers cannot do heavy p ... sick
often; older workers cost ... are
inflexible; older workers ... nger
supervisors. This is hardly definitive, but it is suggestive.

The impact of discrimination on the older workers has been ... But the loss

as they infringe on the recessive characteristics of old age have not been measured.

Significant steps being taken to-day—Job analysis is a proven technique to step up placement of elderly in jobs they can perform. Physical examinations, designed not as most are to determine what a prospective employee's ailments may be but to determine his fitness and his ability to perform specific jobs in a plant, have proven effective in successfully enlarging work opportunities of cardiac cases in upper age brackets. Specialised job counselling for older workers has proven effective in Canada and the United States, as has group work with prospective job seekers. Re-engineering of jobs to adapt them to ageing workers has proven helpful to a number of medium-sized firms.

Retraining experiments in Sweden and the U.S.A. have proved successful with older workers whose skills have rusted or who needed new skills to be employed. Removal of formal age barriers in civil service has helped in England and the United States. [illegible]

that need only careful evaluation to yield a great deal of valuable data. We need to evaluate the legislation that has been adopted in Massachusetts, U.S.A., to bar discrimination in hiring of those unde [illegible]
be fil [illegible]
deter [illegible]
employees.

The effectiveness of set-aside of public jobs for oldsters by Denmark, subsidies to employers hiring the aged by Switzerland, government sponsored training centres open to the aged in France, Italy, Japan, Belgium, and Switzerland need to be evaluated. [illegible]

Employment Security Bureau, Bureau of Statistics, etc., on behalf of the older worker; and efforts are being made to set up a management-labour-public committee within the Department to aid this effort. Colleges and foundations are supporting a variety of research largely in areas of pensions and retirement. And a few states, such as California and New York, are attempting to use (*a*) education of the public and employers; (*b*) a limited amount of special job counselling; (*c*) research to stimulate employment opportunities [illegible]

Nuffield Foundation's support of such research is of significance to management around the world. The government's current inquiries are serving both to lay sound foundations for future policies as well as to educate employers and unions, both of which groups are represented on such inquiries. As an example, a leaflet on employment of older men and women was distributed to 10,000 members of 383 local employment committees, and discussions are going on at employer and union meetings. In England, age 60 has been set as a top age for recruitment of typists and telephonists, and the government is re-examining its own age policies regarding other civil service posts.

Canada's Department of Labour is encouraging self-surveys of the problem by employer groups, has launched an extensive propaganda campaign, and its programme of special counselling of older workers has inspired activity across its borders.

International research needed—This hasty review of some key developments on our globe points up the need for an international pool of data so that each of our countries could benefit. There is a gold mine of material available in each nation as yet untapped. [illegible]

agricultural to industrialised economies, for nations whose traditional family system is altering with profound impact on older workers, for nations planning in advance to check economic declines, such material should prove invaluable.

There is much we need to know, for example:—

1. Impact of land reform upon older job seekers.
2. Impact of foreign companies' personnel policies in undeveloped countries.
3. Assimilation of older immigrants into the labour force.
4. Lifetime work histories of sizeable segments of the labour force.
5. Alternative policies for dealing with older workers in varying phases of the business cycle.
6. Development of an index of discrimination.
7. Multiple discrimination against older workers of minority groups.
8. Modification of entry job policies to facilitate hiring older men, and turn-over rate by age of worker in firms "promoting from within" as well as in those that do not.
9. Studies of the self-image of older workers.
10. Study of concept of "young-old," "medium-old," and "old-old" in relationship to work force.

CONCLUSION

We see little chance that in industrial societies there will be any mass return of older workers to factories and offices, in view of the continuous drop in proportions of aged employed from 1880 to the present time, in view [illegible]
ahead, in view of the
hypothesis of histori[illegible]
Increased use of pension systems, altered concepts of "work," expanded education of masses of people with new attitudes toward leisure—all these factors also indicate no great return to work of the aged.

However, the goals of gerontology must not be viewed as revolving around putting oldsters to work but to assure that older workers who need work, want work, and who can be fitted for work are given an equal opportunity with others to obtain work.

Non-selective hiring and firing that uses birthdays as a quick, convenient index of marginality is an anachronism in an age in [illegible]

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[illegible] New York.
[illegible] State Joint Legislative
[illegible]

DARIC, J., Paris. *Survey of the employment of elderly workers in France.*

To throw light on the important question of the employment of elderly workers, the Ministry of Labour and Social Security in France undertook in 1953 a questionnaire-survey in different [illegible] drawn up with the help of experts,
[illegible] rkpeople. These
[illegible] lectrical concerns,
[illegible]

on the following:—

The age structure of the working population by occupation, sex, and skill.

The length of service of employees over 50 years of age.

Age limits for entry into employment and for retirement,

The performance of persons over 50 years of age, including output, quality of work, reliability, absenteeism, and accidents.
Special provision for elderly workers.

I present here the summary results of this survey.

I. Age Structure of the Working Population in Different Industries

Age and sex—The percentage of workers over 50 and over 60 years of age varied considerably with the type of industry. Two factors were at work: the "birth-rate," or flow of entry into the industry, and the "death-rate," or movement out of the industry. A large intake of young workers (for example, in new industries) and the premature departure of elderly workers (as is the case in work requiring physical effort, *e.g.*, mining) make for a "young" labour force. A fall in the entry of young workers, especially in declining industries, and a prolongation of the work of the elderly in jobs requiring more skill than physical effort—these make for an "old" labour force.

The survey gave the following results:—

PROPORTION OF EMPLOYEES AGED OVER 50 AND AGED 60 OR OVER, BY TYPE OF INDUSTRY AND SEX

Type of Industry.	*Employees over 50 Years of Age.*		*Employees aged 60 and Over.*	
	Male.	*Female.*	*Male.*	*Female.*
	Per cent.	Per cent.	Per cent.	Per cent.
Metallurgy, engineering, and electrical industries	24·4	21·8	7·8	5·2
Building industry	19·6		5·2	...
Textiles	29·5	24·2	10·9	7·6
Fuel and power	26·9	20·7	6·8	6·0
Commercial and transport	29·5	23·2	7·1	5·3
Totals	25·6	22·5	7·4	6·5

The highest proportion of employees over 50 was in the textile industries. The lowest was in building. The textile industry similarly had the highest proportion of those aged 60 or over. In general, the proportion of elderly female employees, whether over 50 or aged 60 and over, is lower than the proportion of elderly male workers, and the difference is most noticeable in the textile industry and in commercial firms.

Degree of skill—Most often the proportion of employees aged 60 and over is higher among the technical and administrative staffs than among the manual workers. The percentage is higher still for the administrative and commercial staffs than for the

technical (engineers). The percentage of manual workers over 60 depends upon the degree of skill. With the exception of the metal, engineering, and electrical industries, the figure is higher among the more *highly skilled than among the semi-skilled and unskilled.* The proportion of clerical workers of over 60 differs little from that of manual workers, though the figure is slightly higher for the former.

II. Length of Service, Age Limit of Entry, and of Retirement

As a general rule, the length of service in the firm increased with the degree of skill. This was as true for the technical and administrative staffs as

The age limit for en the degree of skill. For manual e type of industry, and was lower in jobs requiring sustained physical effort than in those demanding less heavy work. For all industries the most frequent age limit for entry was between 40 and 49.

As regards retiring age more than half the firms surveyed replied that they had no fixed rule. For those that had a fixed retiring age, the most common was 60 or 65. The age of retiring usually increased with the degree of skill, and in most industries the technical and administrative staffs worked later in life than the operatives.

III. Performance of Elderly Employees

Output in relation to age varies very much from one type of

younger workers.

For women the fall in output also begins at about 50, but it is more marked among the workers in engineering and electrical industries and in textiles.

work was better between 50 and 65 than that of many younger workers. The same applied to the female workers.

As regards reliability and conscientiousness (economy of materials, care in the upkeep of tools and machines, etc.) this was higher—for every category of worker, male and female—at ages over 50.

Absenteeism—Sickness absenteeism was lower amongst workers [illegible] risky work.

IV. Special Provisions to help the Elderly Worker

Although the possibilities of employing elderly workers vary greatly in different industries, the survey has shown different types of special provision to assist the employment of the elderly. These special provisions were found in only a few firms. They include placing elderly workers in light work, moving them to new jobs where the working day and the speed of work can be modified, *grouping them in special gangs or workshops, and homework.*

Light jobs—It is usually semi-skilled or unskilled workers who are placed on light work, because their previous work required [illegible] for preference for inspection work, control of stocks, and storekeeping.

Length and speed of work—In some cases the employment of elderly workers was affected by modifying the length and speed of work. This allows the worker who becomes elderly to remain at the same job. Sometimes duration, sometimes speed, and sometimes both factors are altered. Sometimes also pauses are introduced into the work. Some firms move their elderly workers to jobs where the speed is not fixed, others organise the work on a half-time or part-time basis so that it can be spread over a reduced number of days during the week. One further point should be noted, namely, [illegible] work for [illegible] rm permits, the creation of special gangs and workshops for elderly people is a good solution. Such an arrangement makes for a [illegible] nd an atmosphere where they [illegible] Some interesting experiments [illegible] ince. One large factory near Paris, specialising in sheet-metal work, pressings, body-building, and the manufacture of radiators for the automobile industry, created first one and then two special workshops for workers in the firm who had reached 65 years. They are employed on light fitting

jobs, repairs, sorting of components, and painting. These workshops represent a halfway stage between full activity and full retirement. The workers, whatever may be their job, receive the pay of the job on which they were previously employed. The experiment has, in fact, proved profitable to the firm.

[illegible]

workers.

Work in the home—The elderly worker is often handicapped by the length of his journey to work; he may also have some physical weakness which cannot be catered for at work; hence the interest in the possibilities of providing work in the home. The survey revealed quite a number of examples of firms which give homework to their elderly workers—amongst them armament manufacturers, precision instrument makers, telephone equipment firms, and electric meter firms. Similar steps have been taken in the firms dealing with leather (glove and military equipment manufacturers) and in certain wood and plastic industries, and for many years the clothing and material industries have provided homework for elderly workers.

V. Conclusion

The making of the survey which I have reported has [illegible] advantages. It has produced very useful data on the [illegible] of the elderly in France from a large sample. The results [illegible] those of similar studies undertaken in a number of [illegible], especially in Great Britain, United States of America, [illegible]. The results also confirm previous work in France (1).

A no less important result of the survey has [illegible] the eyes of management and of all responsible for [illegible] a question the importance of which is so little [illegible] too frequently, scarcely perceived. So it may be [illegible] to evolve the fundamentals for a true policy for [illegible] elderly, requiring in the first place an evaluation [illegible] of the worker as based not solely on "chronolo[illegible] "physiological" [illegible] age, which is a [illegible] acquired in a lif[illegible] the latest knowle[illegible]

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FLEMING, C., Sheffield. *Age composition of the British iron and steel industry.*

Two years ago the Department of Social and Industrial Medicine at Sheffield University completed a medical survey of older persons in their own homes. Since then we have been carrying out an age-composition survey, or "human stocktaking," of the British iron and steel industry. This industrial demographic survey was carried out over 1952 and 1953. For the Sheffield-Rotherham area I obtained data—that is, numbers of operatives at each year of age—from forty-seven iron and steel manufacturing and fabricating companies, large, medium, and small. In Sheffield, iron and steel manufacture is very much mixed up with constructional engineering, in many companies. But eventually quite a number of them gave me the age-composition figures for departments and main work processes as well as for the company as a whole, so I was able to get some insight into the age structure for iron and steel

yet fully analysed. We have been focusing on heavy iron and steel. To be able to compare the industry as it is in Sheffield-Rotherham with other areas, and also to make the survey as comprehensive as possible, before long I started to collect statistics from similar companies in the other five iron and steel areas of Great Britain. That meant another forty-five companies with about 90,000 men.

Briefly, there was found to be no great difference in the general age-composition in these six areas. In the total sample of ninety-two companies, employing over 144,000 men, the percentage of male operatives aged 45 years and over was 41·2; the percentage 65 years and over was 4·1. (As a matter of interest, the average age in the iron and steel industry in Great Britain is higher by about six months than for all male employees in the country.) In this sampling of the industry the "oldest" area—that is, the one with the highest proportion of middle-aged and older workers—was Lancashire-Staffordshire. The "youngest" was Scunthorpe. The Sheffield percentage of those 45 and over was 42·3, and of those 65 and over 4·4. Nor was there a great difference in the age-composition for the aggregate of companies of various sizes. It is realised that there was not a representative sampling of the smaller firms—those employing 500 or less—and certainly not of the very small firms in this industry—those of 100 men or less. Still, data was received from forty-four companies with less than 500 men and from twelve with less than 100. The largest companies in the survey were four with 6,000 men each, one with over 7,000, one with over 8,000, and another with over 11,000.

One interesting and important result from this survey was the information obtained on the wide range of age-composition for particular companies—even those of an essentially similar character and size and in the same are
observations to companies o
as a whole the proportion
ranged smoothly from 25 to 55 per cent.; the proportion of workers 65 years and over ranged smoothly from less than 1 per cent. to over 9 per cent. The latter was a company employing 555 men.

Nearly half the companies concerned, totalling over 80,000 men, supplied age-composition figures for departments, main processes, work groups, etc. With advice from the British Iron and Steel Federation, these were sorted out into twenty departmental group-

cularly informative and suggestive in its results. Among other things, it shows a very wide range of age-composition, on the score of the percentage 45 years and over and 65 years and over in essentially similar departmental groupings. This factual data should be useful in any considerations of industrial adjustments to an ageing work force.

As you can imagine, we have gathered and worked out a large mass of figures. This is probably the largest, if not the first survey of its particular kind. I will try to present just a few illustrative figures showing the range in departmental age structure in this industrial grouping, but in such a way as not to make this confusing. This survey could, perhaps, be regarded as a particularly large pilot survey. Further surveys, better planned than has been possible in this case, may be of use in enabling industry and the country to budget ahead in the matter of manpower.

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staffs felt they could safely employ was about 10 per cent. or less on constructional contracts, and 15 per cent. or more on repairs and maintenance. But the proportions varied somewhat from trade to trade, and depended very much on the precise nature of the contract. The proportion of elderly labourers acceptable on a civil engineering contract, for instance, was distinctly low, mainly because much of the labour is casual and a foreman has to judge at sight the probable efficiency of an ageing applicant.

A comparison was made between the ages of a few thousand men engaged on constructional work and a few thousand employed on maintenance. The proportion of men over 60 years of age on maintenance was about twice as high as the proportion on constructional work—actually about 9 per cent. to about 4·5 per cent. But this does not necessarily represent the numbers of older men who could at a stretch have been conveniently employed in either branch of the industry.

Thus the building industry has some advantage in this respect over many other industries, in that it offers some chance to an older man of transferring to a modified type of work. There is, however, reason to believe that many men postpone the transition to jobbing and maintenance work until late in their working lives. The explanation is, no doubt, that on maintenance work there are few opportunities of earning a bonus rate on the flat wage. It is, nevertheless, not advisable for a man to delay too long. For instance, local authorities with large maintenance staffs may prefer not to take on men beyond the age of 55 or so, especially where they are trying to build up a superannuation scheme for their manual employees. Again, it is desirable that an older craftsman, moving into jobbing and repair work, should give himself time to become familiar with the local property and to get on good working terms with his employer.

With regard to the actual rate [illegible] men and labourers in their 60's [illegible] samples of a few hundred men [illegible] impression we derive from them is this, that, of the men who have reached their 60's in a fair state of working efficiency, somewhere about 40 per cent. have already passed or are passing into a state of "industrial senescence" by their mid-60's. Many of them would, no doubt, remain effective for a little longer if the work could be

modified to suit their physical limitations. After the mid-60's the decline in numbers is fairly rapid, and an increasing proportion of the survivors are represented by men with unusually sound constitutions, who appear to be temperamentally well adjusted to their work. It is observable, however, that the rate of wastage varies somewhat from trade to trade; it is highest among the labourers, though here again a few exceptional men in their 70's may still be found actively at work on building sites.

SHENFIELD, BARBARA E., Birmingham. *Employment prospects for older workers in Great Britain.*

THE volume of employment among older persons will be conditioned by two factors—on one hand by the numbers of older workers both willing and capable of continued employment and upon the other by the job opportunities available to them. These opportunities themselves will depend upon the level of employment and the general state of trade. Prognosis in these matters is notoriously difficult, and here it may only be noted that it is important to decide whether the older worker is inevitably a marginal worker who will be the first to be extruded from any occupation if and when the volume of employment contracts.

Bearing in mind that the most hopeful chance of providing employment for older workers is to retain them after pension age in their former employment, if not in exactly the same job at any rate in the same industry and if possible in the same firm, we must examine which industries would in fact have their labour force substantially augmented if much larger numbers of older workers remained in employment after pensionable age. Are these the industries which require additional labour, and could they use older labour for their needs? It is true that we also want to know not only the industry but the kind of jobs and processes on which an older worker can maintain his performance. There are some light jobs even in what are generally classed as heavy industries and some skilled work is often associated with work which is mainly an unskilled occupation. But it is important to know in which [illegible] proportion of elderly workers are found

[illegible]

of flexibility and initiative to adapt their resources to meet a changing market? In the case of redundancy due to fluctuations in the level of trade there may be no hesitation in deciding that the elderly pensioner must go and the younger family man be retained; where, however, an industry has shown a decline over a lengthy period in the numbers employed and the volume of trade, to retain the young who are wanted for employment in expanding industries and to discard the skilled elderly may prove to be a short-sighted policy.

If we look at the status of older persons as shown in the 1 per cent. Sample Report of the Census of Great Britain, 1951, it may be seen that the workers aged 65 to 69 years who remain in employment form only a very small percentage of the total labour force. The largest numbers are in agriculture, metal manufacture and allied trades, in distributive trades and miscellaneous unskilled occupations. These older workers constitute 4 per cent. of the labour force in agriculture, 4·8 per cent. in personal services, and 5 per cent. in leather and fur trades. The ratio of elderly workers to the total labour force in any particular industry is, of course, conditioned by the age structure of that industry and especially by its experience of recruitment of younger workers. A more significant calculation is the rate of retirement, or conversely, the rate of retention of [illegible] retirement a [illegible] cane retain [illegible] five years, and distributive trades, agriculture, and personal services retain between 50 and 60 per cent. On the other hand, the retention index shows that in transport and communications only 28 per cent. of the 65 to 69-year-olds remain in employment. Given the objective of retaining as many older workers as possible in their former jobs, certain occupations which now have a large number of workers retiring at 65 years are the ones which have to be encouraged to keep more people in employment after this age. Of 403,200 men aged 65 to 70 years who are retired, the largest group, 51,000, were formerly occupied in transport and communications. Other occupations discarding the largest numbers of workers at 65 years are, after transport, metal manufacture and allied trades (44,700), agriculture (33,400), building and contracting (28,900), distributive trades (26,700), mining (26,600), and clerical work (26,000) and miscellaneous unskilled occupations (24,700), these being the industries, of course, with the largest labour forces of all ages. Even if it were possible to arrange for larger numbers of [illegible] the present numbers of pensioners. In trades such as the manufacture of jewellery and precision instruments, where craftsmanship and lifetime experience may be presumed to put a premium upon the older worker, only 5,400 workers are in retirement from these industries whose total labour force of all ages numbers 90,100. If we look at the industries which are shedding large numbers of older workers, it is by no means certain that they could easily reverse this process, even though they may be in need of additional labour.

[illegible]

which for some time has been noticeably short of young recruits. It might be supposed that, with this urgent need for more miners

will not mechanisation and improved techniques, better hours and conditions and health care eliminate part of this strain which used to fall on the underground worker? This argument is frequently advanced, viz., that older men and women who have worked shorter hours under better social and employment conditions will be able

...hanisation and ...g the physical ... In the mining industry to date the very reverse is true. The shortage of manpower is a shortage of men who can work at the coal face. Only a few

men to continue to work as cutters if they took a smaller stint. With this end in view the National Coal Board is prepared to encourage the working of variable stints, but this is not acceptable among the men in most pits.
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bargaining and minimum wages legislation make it difficult to pay the older worker (or, indeed, any older worker who is not as
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cellaneous jobs suitable for older men are now eliminated by the use of machinery. Two examples of such jobs that were formerly done manually are the hand-picking of nuts and cobbles and the removal of dirt or shale from the screen houses. These processes are now increasingly done by conveyor belts. Numbers of older men have already been displaced in this way, and this is likely to be a continuing trend. The few light jobs and simpler tasks still available have to be apportioned between the Disabled Persons quota, ex-accident and compensation cases to whom the industry feels a special obligation, and young "green" labour progressing via the less difficult tasks to work at the coal face. Older men are not able to be used very widely to induct younger recruits into the industry, since conditions and methods are rapidly changing, and to some extent this outmodes the older man's knowledge and skill.

to remain it is difficult to maintain production when the labour of the younger men is withdrawn. Such a policy may more quickly advance the time when the pit has to be closed as an uneconomic undertaking. In areas where a number of uneconomic pits have to be closed and miners are encouraged to migrate to neighbouring fields where their labour can be utilised, it is not easy to find employment for older men. *The demand is for younger men able to work* at the coal face and the pits which are anxious to secure such labour usually already have their own accumulation of disabled and older workers and have few vacancies of this kind.

[illegible] occupational grouping [illegible]

and the *numbers retained are lower than in many sectors* of private business. Among railway workers, for example, those (males) retained to ages 65 to 69 years are only 15·6 per cent. of those engaged aged 60 to 64 years. *For all workers in these services the* "retention rate" is only 28 per cent. Is it likely or desirable that these numbers could be increased? Among road transport workers over three-quarters of those occupied are drivers of vehicles. Any [illegible] the elderly, or slowness of [illegible]

In passenger transport services, in the interests of the travelling [illegible] standards of physical [illegible]s [illegible]is undetected in other forms of employment. Apart from this kind of elimination on medical grounds, and the further voluntary retirement not unrelated to the strain imposed by the nature of their work upon the "platform" staff in transport services, there are very substantial objections to continued employment after pension age. These arise from the organisation of the work in some sectors of the industry. Among railway workers particularly a steady promotion from lo[illegible] by improvements in qualification[illegible] process. This [illegible] pension age, si[illegible] *down the line by the retention of a man of pension age* in a senior position. Apart from the very lowest grades of unskilled labour, the railway workers are not prepared to see any man retained after pension age in his existing position. Theoretically, *if retained* he [illegible] at the bottom in the junior grades. The [illegible] ice is [illegible] otion [illegible] ached [illegible] -times [illegible] is ex-

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communications where relatively few older workers are retained (28 per cent.), large numbers of workers are employed by public authorities. Similarly, few older workers are retained in water, gas, and electricity services (29·4 per cent.) and Local Government service (27·2 per cent.). Can public authorities as employers set a better example in making the maximum use of the labour and skills of older workers in the services for which they are responsible ?

The experience of one public authority in this respect is of interest. London Transport Executive, though finding it impossible to retain many railway workers for some of the reasons suggested above, have tried to use older workers in road transport as long as they wished to remain in employment. (The retention is subject

(These figures are to some extent affected by the fact that some of the staff transferred with the old local authority tramways in 1933 were protected in this respect.)

Though as one would expect the greater numbers are retained on maintenance and miscellaneous duties (802 men over 65), there are 448 drivers and 223 conductors employed on buses and trolley buses in the central area of London.

The distribution of the labour force in road transport at January 1954 was as follows :—

	Total.	Percentage of Total.	Total (Men).	Over 65 (Men).	Total (Women).	Over 60 (Women).
Platform staff .	45,520	68	40,650	783	4,870	1
Maintenance .	18,326	32	18,241	391	85	8
Miscellaneous	3,704		1,495	68	2,209	100
Totals	67,550	100	60,386	1,242	7,164	109

Thus the transference of men to maintenance work is only a limited outlet for the older transport worker. Not more than about one-third of the staff is likely to be employed on maintenance and miscellaneous duties.

Transport is not a popular industry, and in a period of full

employment the disadvantages involved in duties which fall outside normal working hours are not sufficiently offset by current rates of pay to attract and retain the labour force needed to man existing services.

This is especially true in areas such as the industrial Midlands, [illegible]

during the year though only ninety-three employees were compulsorily retired by reason of some disablement. Further, these transport workers are covered by Local Government superannuation schemes under which a man is entitled to a disability allowance if he is unfit to continue his service before retirement age. Such men may be fit for other employment and are not lost to the labour market, since most of them take other work demanding less rigorous standards of eyesight and general physical fitness, and they can, of course, do this without any loss of their disability allowances.

[illegible]

raise the age of recruitment of busmen to 50 years).

As the experience of the L.T.E. has shown, a minority of older workers can be retained, but, in general, other sources of labour such as women are being recruited by the inducement of equal pay to offset awkward work schedules. In the immediate future it is more likely that changed techniques, such as operating some routes with one conductor-driver, or re-designing vehicles to accommodate more passengers, that is, adopting methods which seek to economise in the size of the labour force, will be employed rather than more elderly workers.

During inquiries made (by the author) about the employment of older workers in fifty-seven firms of varying sizes and trades in the West Midlands, the response of employers and their personnel managers was almost always the same. They commended their older employees for their punctuality and attendance records and their conscientious attitude to their work. Asked to comment upon their older employees on the following matters, need for supervision, respect for employer's tools and property, keeping general rules, influence on behaviour of other workers, and attitudes towards the management and sense of loyalty to the firm, 63 per cent. of all firms gave information favourable to older workers and 48 per cent. favourable information under all these headings. Most of the employers stated that they had no prejudice against retaining older workers who were willing and able to remain beyond normal pension age, but, in fact, very few were employed.

Further, whilst most employers expressed themselves as in no

way adverse to employing people in any occupation for the first time when they were over pension age, they almost invariably then went on to demonstrate that this would be impossible, however, in their particular trade. Thirty-seven firms had never tried training older workers for new tasks and thought it impractical; five stated that they had experienced no difficulty, and seven that they had found some problems.

It appears unlikely that employers will ever choose older men in preference to younger men as long as the latter are available in the labour market, except in the circumstances where the older candidate clearly possesses qualifications and skills not able to be offered by younger men. In the long run as the labour force ages employers will have less choice, but in the short run each will seek wherever possible the younger man. These observations refer mainly to industrial employment and apply with perhaps less force to some employment in professional, managerial, and executive posts. But to this extent the older worker and certainly the man over pensionable age are marginal workers drawn into the market when there is no alternative and very much less easy to employ if the level of employment falls.

Even where employers may wish to retain older workers, it is difficult for them to do so in the face of any redundancy among the young. One large firm reported that they had been faced with just this situation. After the war they found it necessary to reduce their number of employees, and though they would have preferred to retain their pensionable employees who had stayed or returned to help the firm through the exceptionally busy period, they had to accept the demands of the trade union representatives to let the elderly go in order to retain younger men, some of whom had only a very short record of employment with the firm. This is not to say that trade unions are not sympathetic towards the needs of the older worker, but that where any substantial number of younger men are involved in the prospect of unemployment, the union is likely to demand that the pensioners must go first. In the short run, wherever the labour of young and older men is directly competitive, the older worker is certainly likely to be regarded as a marginal worker. No amount of official statements to the contrary will alter this.

Even when there is an overall shortage of labour, this must be examined carefully to eliminate labour need which older employees would be very unlikely to be able to fill. Recruitment to the Armed Forces, Police, and Fire Services and similar occupations cannot be considered by the elderly, though the gaps left in industry by the withdrawal of fit young men to such occupations may be filled by older men. Even industrial needs in so-called "light" industries are by no means suitable for older men. Many such advertised vacancies are for women experienced in quick, deft, repetitive work. Women themselves are often unable to maintain their speed of performance with increasing age in this type of work and find

difficulty in learning new processes. It is unlikely that older men could acquire at a late age the necessary dexterity to be able to maintain the pace set by machines. It would be more expensive to employ men's rather than women's labour and not easy to fit older men into the supervision arrangements planned for young women. Moreover, in some trades older men anxious for employment may be willing to take work formerly done by youths, *i.e.*, internal postal and messenger services, but would rather leave than accept what they term contemptuously "wenches' work."

It is scarcely useful, therefore, at present to suggest that the numbers of married mothers in industry, for example, could be reduced by the greater employment of the elderly. We should, of course, beware of traditional prejudices and remember that in certain occupations the relative numbers of men and women have greatly changed in recent years, *e.g.*, male nurses and female bus conductors, but this has usually been an interchange of the young and physically fit rather than older workers.

The conclusion is that there is no immediate prospect of a substantial increase in the numbers employed who are over-pensionable age. Changing attitudes on the part of both employers and older workers may modify this in time, but employment of the elderly is unlikely to make any marked reduction in the "burden" of the elderly in the near future, unless new ways can be found of using productively the skills and experience they possess.

MATHIASEN, GENEVA, New York. *Practices in American industry.*

THE purpose of this paper is to review briefly some of the developments related to continued employment and retirement of older workers in the United States as seen through the work of the National Committee on the Ageing since the last meeting of the International Gerontological Congress.

The National Committee on the Ageing believes that the most satisfactory way of life for those elderly people able and desiring to work is to continue on the job. This belief is based on the present emphasis in our culture on the importance of work; the low incomes of most retired workers; the fact that usually group health insurance carried as part of a company plan expires with retirement; and the cultural lag in assigning significant social roles to aged persons regardless of their personal characteristics. Several years ago, however, the Committee took cognisance of the significant fact that Old Age and Survivors Insurance payments under the National Social Security plan become available at age 65 and that under private pension plans, entered into for the most part as a result of bargaining agreements, automatic retirement at age 65 appeared to be the rule.

Before this principle should become firmly embedded in

five leaders from industry, labour unions, universities, government bureaus, and social agencies in a National Conference on Retirement in January 1952. In this endeavour and in its subsequent work in this area the National Committee on the Ageing was joined by the McGregor Fund of Detroit, Michigan, which not only provided the funds to carry on the work, but through a committee of the trustees has participated actively in the planning.

A detailed report of the conference and three monographs prepared by some of the country's leading authorities as background material is available in book form (1). Most of the participants agreed that retirement based on chronological age is "socially unwise and economically unsound." Subsequent work of the Committee was based in part on the opinion of those favouring compulsory retirement that until other objective criteria are developed chronological age is the only basis for impartial decisions; and in part on the belief that under flexible retirement practices objective

workers.

The Committee is now engaged in a two-year project begun in January 1953 on criteria for the continued employment of older workers. The work is guided by a central advisory committee and carried forward through four technical committees comprising in all seventy-six persons including seventeen industrial physicians, thirty-two industrial relations and personnel administrators, two physiologists, six psychologists, seven rehabilitation specialists, five industrial engineers, and seven labour union representatives. The subjects with which the technical committees deal are as follows: (*a*) Appraisal of Older Workers, Job Requirements, and Job Performance Evaluation; (*b*) Job Modification and Job Re-design; (*c*) Physical Tests and Measurements; (*d*) Union-Management and Employer-Employee Administration. The first formal documents of their reports were to be presented towards the end of 1954.

The first step in the project was an informal query of some 500 firms regarding their retirement and retention policies and

accompanied by physical and environmental demands schedules. These were coded by use of letters and numerals. Employees at the time of hiring were also coded through interview and physical examination in terms of both their abilities and limitations. These two sets of codes could then be matched in order to make the most effective placement. The company believes that this programme is the predominant factor which has enabled them both to employ considerable numbers of personnel in higher age brackets and to keep them in employment longer.

Not many companies have made a systematic attempt to compare the records of their employees kept on after normal retirement age with their previous records. One company, however, has studied working abilities of seventy-one male employees 65 to 72 years of age and compared performance of each with his work record during ages 60 to 65. Results showed sixty-two doing the same job, sixty-two doing the same quality (two better, six poorer), forty-one working at same speed (twenty-seven slower, three much slower), fifty-three [illegible]

The Committee hopes to encourage more studies of this kind by companies with records over a period of years, as the best current substitute for long-range longitudinal studies.

The investigation of the Committee reveals that most of the current practices were developed to meet individual company pressures rather than as a result of general policy about older workers based on techniques and information presently available about skills and capacities of older workers.

The technical committees hope:—

1. That some of the experiences reported in this and other studies can be analysed and the techniques so identified and refined as to permit recommendations to be drawn which will be applicable generally. (For example, a baking company formerly required an operator to load an oven at the rate of four pans every eight seconds and then rest seven seconds (3). This sprint-rest schedule was fatiguing for older persons. When the mechanism was re-designed so that the worker loaded four pans in fourteen seconds at a steady pace the job can be performed by an older person as well as a young one. Current knowledge about the work capacities and response to stress of older people would suggest similar kinds of adjustment in other industries.)
2. That some tests now in the laboratory stage may be adapted and used by industry.

3. That recommendations can be drawn for research which will provide new knowledge in the areas directly related to information needed by industry to formulate their

4.

often in institutions, as is true of most studies at the present time.

A few words may be said about trends in compulsory retirement and in pre-retirement counselling. Two recent studies, one by Bankers Trust Company and one by the United States Bureau of Labour Statistics, indicate that the trend appears to be towards more flexible retirement policies. Of 300 plans analysed by the Bureau of Labour Statistics, 125 covering 42 per cent. of the workers did not have compulsory retirement; 175 contained compulsory retirement provisions. However, in 114 of these extension beyond the compulsory retirement age could be granted.

against inflation. Payments are geared to the Consumer Price Index figures published regularly by the Bureau of Labour Statistics.

There has been increasing interest during the past few years in programmes to prepare workers for retirement (4). Characteristic of new plans adopted by such companies as Stetson and American Airlines is the recognition that the programme must start well in advance of the retirement age. American Airlines holds individual interviews five years, two years, and ninety days prior to normal retirement date.

Of possible significance is the fact that two cities, Chicago and Minneapolis, have under consideration plans to provide pre-retirement counselling as a central service available to workers in industry, which will contribute to its support; and that in a number of communities courses in preparation for retirement are being

one-fifth of whom have had less than five years of schooling and two-thirds of whom have had only grade school education.

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PETERSON, R. L., Illinois. *Effectiveness of older workers in a sample of American firms.*

ABOUT 65 per cent. of America's working population is engaged in industrial, retailing, office, and managerial tasks.* While everyone is aware that these millions of workers are growing older each day, there has long been a question in the minds of business administrators and others as to how older employees in these tasks compare in work efficiency with average younger employees. Because there has been so much talk about the effectiveness of older workers, and so few facts offered in support several well-known mid-western organisations were asked to co-operate with the Bureau of Business Management of the University of Illinois in a survey on the effectiveness of older industrial, retailing, office, and managerial personnel.

This is a composite report which describes findings elicited through three separate studies covering a total of 3,077 personnel 60 years of age and older (78 per cent. male, 22 per cent. female) in eighty-one organisations. The first study was undertaken when a group of retailers raised a question concerning the possible use of older people to meet personnel shortages in retail stores. To obtain information a rating form was developed and supervisors in twenty-two retail stores evaluated 527 older personnel. The findings were so revealing that a second study was conducted, covering 1,525 older industrial personnel in thirty-nine industries. Later, a third study was conducted covering 1,025 older office and managerial workers in twenty organisations. Incidentally, there is a great similarity in the findings of each of these three studies, indicating that the performance of older personnel is not greatly affected by the kind of work in which the employees are engaged.

Survey procedure—*The studies were initiated by asking top* executives in co-operating organisations to determine how many employees they had on their payrolls who were 60 years of age and older. It was found that older workers constituted approximately 5 per cent. of the total employees in these organisations. An appropriate number of employee rating forms was then sent to each organisation for distribution to supervisors. Supervisors in

* According to the 1950 U.S. Census Summary of Population, the total employed population is 56 million, of which about 20 million are in industrial work (operatives and craftsmen), 4 million are in retailing work (sales), and 12 million are in managerial, clerical, and kindred tasks.

these organisations were then asked to rate each of their workers who was 60 years of age and older. In addition, they were admonished to " Answer all questions honestly and realistically," and were informed that " Ratings are entirely confidential." After supervisors had completed their evaluations the rating forms were sent to the University of Illinois, where the results were tabulated.

It will be observed that in obtaining data concerning older worker effectiveness, complete reliance was placed on supervisory opinion.
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obtainable of older worker competence and performance.

Age of workers—The average age of personnel in the survey group was approximately 64 years. The survey group was distributed into age categories as follows:—

Age Groups.	Number of Employees.	Percentage of Total.
60 to 64	1,940	63
65 to 69	821	27
70 to 74	225	7
75 and over	91	3

The high percentage of employees in the 60 to 64 age group is doubtless due to the fact that in approximately one-half of the ... requiring

of the older workers in the survey group had been with their present organisations for most of their working careers. However, it was disclosed that only 24 per cent. had spent thirty or more years with their present organisation. Surprisingly, 38 per cent. of these older workers had been with their present organisations less than ten years.

These figures suggest that post-war shortages in the supply of available workers have been instrumental in encouraging employing organisations to raise their age limits in employment and to seek recruits from among the older age groups. That employers were not unwise in pursuing this course is reflected in the specific findings of the survey which follow:—

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employees in the four age categories; while one might expect the

favourableness of the ratings to decline sharply as age increased, the figures do not support such an expectation:—

Age Groups.	Excellent.	Very Good.	Good.	Fair.	Poor.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
60 to 64	14	28	39	17	2
65 to 69	15	27	35	20	3
70 to 74	12	37	33	15	3
75 and over .	14	22	43	20	1

There is, of course, a question as to how younger workers in these organisations would have fared in a similar evaluation of overall performance. While no ratings of younger personnel were prepared, it seems unlikely that employees under 60 years of age would, as a group, have received ratings more favourable than those given older personnel. This is indicated by the following data in which supervisors have specifically compared the performance of older workers with that of average younger workers:—

Absenteeism—Older personnel were rated by their supervisors as being much less prone to absenteeism than average younger personnel, *as shown by the following ratings: Less absenteeism, 66 per cent.;* about the same, 25 per cent.; more absenteeism, 9 per cent.

There were no important differences in the ratings assigned to employees in the four age categories (60 to 64, 65 to 69, 70 to 74, 75 and over). Actually, the survey results show a very slight decrease in absenteeism paralleling advancing age.

Dependability—Fully one-half of these senior workers were regarded by their supervisors as being more dependable than average younger workers: More dependable, 51 per cent.; as dependable, 43 per cent.; less dependable, 6 per cent.

No important differences were found in the dependability ratings assigned to employees in the four age categories. Those in the far-advanced age groups were given ratings on dependability which compared favourably with those assigned to employees in [illegible]

[illegible]

rated older workers, in comparison with younger workers, as [illegible] Better judgment, 33 per cent.; about the same, 57 per cent.; [illegible]

[illegible]

group were rated by supervisors on the quality of their work, in comparison with average younger workers: Better work quality, 34 per cent.; about the same, 59 per cent.; poorer work quality, 7 per cent.

A check of ratings assigned to employees in the four age groups reveals no evidence of a decline in work quality paralleling advancing years.

Work volume—A major criterion in the evaluation of an employee is productivity. In this survey the various supervisors were asked to compare the work volume of older personnel with that of average younger workers: Higher work volume, 24 per cent.; about the same, 56 per cent.; lower work volume, 20 per cent.

Ther [illegible] "eling advancing years. [illegible] ployees 75 and over) 1([illegible] work volume, 59 per cent. were reported to have a volume about the same, and 31 per cent. were reported to have a lower volume of work than average younger personnel. In other words, more than two-thirds of the oldest personnel in the survey group were rated as having a work volume as good as, if not better than, average younger personnel.

Getting along with others—Supervisors rated each older worker on his human relationships, in comparison with average younger workers: Get along better with others, 32 per cent.; about the same, 59 per cent.; get along less well, 9 per cent.

No important differences were found in the ratings assigned to employees in the four age categories, thus providing no support for the traditional belief that workers present problems in human relations the older they become.

Remaining years of service—One of the most important questions asked in the study related to the number of additional years of productive service which supervisors believed older personnel would be able to give their present jobs. Supervisors were asked to write "Indefinite" if an employee showed no signs of weakness or decline which suggested a specific limit on the number of years he would be able to continue working. The survey results showed that 26 per cent. of the group were rated as "Indefinite." Of the remainder, the average undividual was estimated to have before him approximately five and a half years of additional service.

Age-connected weaknesses—Supervisors were asked to list any weaknesses in employees which they regarded as age-connected. They were not to list unfavourable qualities, such as inaccurate work or stubbornness, unless they considered these characteristics to be the result of advancing age. It was startling to find that 69 per cent. of these employees were rated "None"—indicating that they had no apparent age-connected weaknesses. Of the remainder, [illegible]

absence of any relationship between age of supervisor and ratings. It was found that supervisors in each age group rated their older employees with remarkable similarity.

CONCLUSION

The findings of this study are highly favourable to older personnel. However, the reader is cautioned to infer no more than is actually indicated. There is a suggestion, for example, that older people tend to become more efficient by virtue of their age alone. This inference, of course, is not sound because it fails to consider that

ROBERTS, A., Manchester. *British trade union attitudes to the employment of older men and women.*

EVERYONE knows the interest which trade unions have in wages and working conditions, but the general public is not as aware of the very long-standing aim of unions to secure continuity of employment. Union endeavours about wages and holidays and safety meet with a good deal of sympathy from the public, but union attempts to

is relatively new. Only twenty years ago many fair-minded people, otherwise well disposed towards the manual worker, considered it

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negotiation was at best misguided and at worst vexatious.

Be that as it may, the fact remains that " the right to work " has always been much more than a slogan to trade unionists. Craft unions (which were the earliest unions) sought to secure regular employment for their members by what the Webbs called " the device of the restriction of numbers." This device took many forms,

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the employment of married women.

We have trade union members of all ages between 16 and 80,

but the key group is of those between 30 and 50 to 55. Leaders will often be older than this, but the main membership of district and national committees are between these ages, and it is they who form union policies. They are chiefly men—men with families—and their reactions to most economic problems are conditioned by the wants and apprehensions of the normal family with growing children. In this context "the right to work" means particularly the right to work of adults and of those under 60 to 65. When there has to be a choice it is in favour of the age group with the greatest domestic responsibilities. There has, therefore, always been union

National Insurance scheme) a retirement condition. The unions' view—from a hundred years ago—was that older workers should be helped on condition they do not compete for scarce jobs. And you must remember that in days gone by, when enforcement of a national rate for the job was much more difficult than to-day, competition for scarce jobs by older workers was aggravated by their doing other work below the rate.

During this century, with the introduction and development of State pensions and the spread of supplementary industrial schemes, *union superannuation arrangements have declined in importance.* Just as unions held and, of course, still hold that full employment is a State responsibility so they pioneered the view that relief of misfortune, whether occasioned by ill-health or unemployment or old age, was also a public responsibility—or more exactly the view was and is that employers and the taxpayer should assist the worker to insure against such misfortunes. Especially is this so about old age. *Ill-health or unemployment may not come, or at least long*

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working week. A number of unions retired their own officers at

in cases where management had to declare a proportion of employees redundant, there were attempts by unions to avoid some of their members being totally *unemployed by sharing the available work*

Since the war we have had nine years of almost full employment, and union attitudes are changing under this welcome novelty. It is too early yet to be definite, but it seems to me that the old principle of " the right to work " is being extended to " the right to work for all adults irrespective of age."

Our manpower position is regularly reviewed by the National Joint Advisory Council, which is one of the additional " Parliaments " we now have in Britain through which Cabinet Ministers can consult with representatives of important voluntary bodies and be advised on the policies their Ministries should pursue. The N.J.A.C. is composed of representatives of the T.U.C. and of public and private employers; the Minister of Labour is its chairman. The main concern of the N.J.A.C. is that of manpower—increasing the supply of labour, raising its skill through improved training, and urging more effective use of this skill through better leadership and more sensible relations between management and operatives.

The N.J.A.C. agreed in 1951 that older workers should be retained in employment for as long as they wished to continue providing they are fit and that no barrier should be put in the way of older workers taking new employment. It was as a result of this decision taken under the previous Government that the National Advisory Committee on the Employment of Older Men and Women (on which I serve) was set up by the present Government.

The Committee realise that they are far from knowing all the answers. Indeed, the main reason for publishing their First Report last year, when their work was far from complete, was to incite much wider discussion of the problem and to invite further research. All our unions had copies of the Report and our Trades Councils had copies of the shorter version. It was also discussed by Employment Committees on which trade unionists and employers' representatives serve in the various localities. There is fairly general agreement among trade unionis[illegible] tion about engagements—name [illegible] not age, and that practices or [illegible] place an age barrier in the way of older people obtaining work. I think, however, that most unions regarded this statement as merely in line with our long-standing objection to age barriers against middle-aged persons obtaining positions in certain occupations. Our own Trades Union Congress in 1950 reiterated its pre-war condemnation of upper age limits being placed on applicants for vacancies—I ought, however, to add that our Congress had *particularly in mind the age limit of 40, which is sometimes* set for [illegible]

[illegible] the whole, whatever objections there can be to the Committee's first recommendation will come from management rather than from my side of industry.

The Committee's second recommendation says that all workers

who can give effective service either in their normal work or in alternative work should be given an opportunity to continue to do [illegible]

developed without it. Instead, we know that wealth is created only by labour, that there are many goods and services to be produced, and that there is no superfluity of people to produce them. We are aware, too, that the rhythm of working life is now tempered by the long week-end in most industries and by at least two weeks' holidays with pay (and the customary public holidays), and that it can be irksome and even harmful suddenly to throw off working harness at a fixed age which has a traditional more than a medical significance.

The plain fact is that 870,000 men and women over " normal " retirement ages were working last year in Britain and that more than 230,000 of these were over 70. In textiles, which is the industry I know best, 6 per cent. of all the male and 4 per cent. of all the female employees at work last year were above retiring age. Most of our unions are likely to have been influenced by what is in replying about what should be.

Unions in engineering, steel, building, textiles, boots, docks, [illegible]

from the two iron and steel unions may be particularly interesting, since this industry has a hierarchic structure uncommon among manual employment and where the long-established promotion arrangements are based on seniority. On the other hand, in the clerical field, particularly in Government employment, where pro- [illegible]

overcome by general appeals based either on the national need or the welfare of an older generation. I do not doubt, however, that safeguards can be obtained by thorough examination of the particular circumstances by both sides in each industry concerned. For clerical staff on railways where the earlier view was compulsory retirement at 60 for both men and women, employment is now [illegible]

From agriculture there comes a different story and a rather sad one. The Ministry of Labour figures show this industry to be among those with the highest proportion of men working over the age of 65. The union is favourable to the Report partly because of present manpower requirements and partly because older workers should not have their employment ended against their will at a fixed age. They point out, however, that some of their members continue after 65 when they are not fit to do so and that they continue because from low wages they have no savings. This union particularly welcomed the intention of the Committee to investigate further into the capacities of older workers. Earlier on I mentioned union fears about older people working below the rate; nowadays in agriculture there is a [illegible] for the job while [illegible] 65 can apply for [illegible] which they are excused some of the heavier work and sometimes work less hours.

Our seamen's union has asked employers not to take exception to men who have been a long time in the industry but who now suffer from minor physical defects, and the Maritime Board (both sides of the industry) has objected to the International Labour Organisation's Convention 73 which provides that seafarers, as a condition of employment, shall pass a regular medical examination. The Board has advised the Government that whilst in full sympathy with the objects of the Convention, they can see no way of implementing it without prejudicing the employment of some good and efficient seamen.

In this brief account of union opinion I can refer only to a few industries. It might be useful, however, to mention the comments received from the largest of our printing unions, since they include [illegible]

Let us take a field of work where employment is regular, comparatively well paid, and without disincentives of particular risk to life or limb—but a field where the demand for labour is not expanding. Such an industry is attractive to young people, but there is not much room for young entrants and there will be even less if older workers are encouraged to stay on. In such circumstances to show more consideration for older workers by waiving the retirement age means that less consideration can be shown to potential young starters into the industry. This is more difficult than the promotion problem, which is only one of delay. To make retiring age flexible may postpone promotion, but (in industries where the labour force is unlikely to grow) it can completely close the entrance to an apprenticeship, the age limits of which are not flexible.

I hope I have said enough to show that union attitudes are changing now that some of the century-old anxieties about security are reduced. If heavy unemployment were, however, to return to

Britain there would inevitably be a further revision of union attitudes.

JOHNSTON, F., London. *Management and the employment of older workers.*

Before the interim report of the National Advisory Committee on the Employment of Older Men and Women was issued, my firm had done quite a lot of pioneer work in utilising more fully the elderly worker. Having already made a survey of all jobs in the firm in connection with the employment of disabled persons, it was a natural step from the information available to earmark those jobs which appeared to be suitable for elderly people. To the more usual type of job such as labouring, stores, maintenance, and inspection were added jobs like postal messenger, prototype-making, and certain precision fitting work where great accuracy and quality of work were more important than quantity.

We have also managed to transfer elderly workers who found the stress and strain, and in some cases the responsibility, of their present jobs too much for them to other less exacting jobs, involving sometimes lower rates of pay, which were in most cases accepted

It is surprising how many suitable jobs can be found for the elderly, and even in the most unlikely trades investigation has led to the greater use of the elderly being made.

Reference is made in the first Report issued by the National Advisory Committee to the difficulties caused by pension schemes, and Mr Pingstone deals with those points more fully (p. 331). It is a fact that so many schemes, we have found, do tend to exclude the older workers because as a rule he can only be admitted at extra cost to the employer. We, at our firm, have not allowed this to become a serious obstacle. We do not operate as yet an official pension scheme for manual workers, but for many years past the individual circumstances of each employee retiring after many years of service are reviewed, and if appropriate an *ex gratia* pension is granted by the Board of Directors. Pension schemes therefore do not handicap recruitment of manual people, and so far as staff people are concerned the maximum age at which a man can be admitted to our scheme is 54½, and it has been found in practice that not many men around this age wish to join the pension scheme and are quite happy to be engaged without participation

many of these people who apply to us for jobs are already drawing superannuation from a previous firm and either find it insufficient for their needs or prefer the interest and companionship of a

Very much the same reasons motivate a manual worker, except that in the majority of cases they would have to manage on the State pension.

At our Lewisham works, where of our total of 3,500 employees we have a strength of about 1,300 (850 men and 450 women), we are *to-day employing seventy-two men of 60 and over, and twenty* women of 55 and over, all in all with satisfactory results. Of the seventy-two male "over 60's" forty-eight are manual workers, twenty-four of them being skilled, six semi-skilled, and eighteen unskilled. [illegible] machining, [illegible] foundry. T[illegible] keeping and packing, and such simple machining as drilling. The unskilled are labourers, night watchmen, and car-park attendants. It is significant that no less than twenty-three of the forty-eight have been engaged by us during the last three years, including seven skilled and six semi-skilled men. On our staff side we have twenty-four men of 60 and over employed as foremen, draughtsmen, progress and planning engineers, etc., and of these six have been engaged in the past three years as wages clerk, shipping and despatch clerk, postal messenger, senior inspector, and sales representative. Of the twenty women of 55 and over we have seven in the factory as [illegible] shorthand typists, clerks, and State-registered nurse in charge of the surgery.

An interesting case among elderly men happily settled down in work novel to them is that of an ex-schoolmaster of no less than forty-three years' standing, who for the past eighteen months has been employed on testing delicate instruments. Having been a science master he had the necessary background, and his patience and painstaking attention to detail are an example to much younger [illegible] when [illegible] raid, [illegible]

Another man, aged 71, before coming to us was employed on various stores and clerical jobs. He is to-day doing an excellent job as wages clerk, even though new to wages work. So keen is this particular [illegible] recently studied for a[illegible] book-keeping and [illegible] nmerce. Heartened by his success, he now proposes to continue studying, and will sit for the intermediate examination set by the Royal Society of Arts.

We have a former very senior executive in a chemical engineering company now working effectively for us as sales quotation engineer dealing with customers' inquiries and quotations. Perhaps the most remarkable case is that of a valued member of our sales staff who was

71 years of age when we engaged him five years ago, and whose contacts and wealth of knowledge have been a consistent asset to us. On a different level we have an ex-manager of a billiards hall now contentedly doing light labouring work such as sweeping and fetching and carrying components in a light assembly section. One, who is now aged 75, who had been on road-making and heavy steel erecting work for most of his life, is now doing a very good job tending the flower beds and window boxes around the works.

The oldest member of our staff has been with us for fifty-eight years, and is now 78 years of age. He officially retired from full-time work at the end of last year, but the intention was to retain him as a part-time consultant. In actual fact, he puts in just as much time as ever he did. This very much respected member of the staff from testroom assistant became chief electrical engineer of the Company, and of late years has looked after our patents department and technical library. Here is a case where the individual has been quite happy to accept less responsibility and to hand over the reins to a younger man. We are very pleased indeed that his knowledge and wealth of experience are still available to us. Two others who spent all their working lives with us are now enjoying their well-deserved retirement, but come into the works on an odd day here and there in a consultative capacity.

Among our elderly women employees we have a full-time worker who has been in the factory forty-six years and is still on the bench, and a shorthand typist of equally long service who at the age of 71 still does a fair quota of work for us, even though no longer working full hours.

At our Rochester works, where we employ just on 1,200, of whom 200 are women, twenty-three men are aged 60 and over—four skilled, three semi-skilled, and the rest unskilled. Nine women are aged 55 years and over, and are occupied as canteen workers, cleaners, and a few in the paint shop or rubbing down and stopping. In comparing these figures with the Lewisham establishment it must be remembered that the Rochester factory was opened only seven years ago, and therefore has not the same historical background as Lewisham.

Apart from those elderly workers who are capable of putting in a full day's work, there are those who for health reasons find it too much of a strain to work normal hours. In such cases we are always ready to vary the hours of work to suit the individual circumstances. One might be allowed to come in anything up to an hour late in the morning and leave, say, one hour before the normal finishing time. We have a number of rush jobs which crop up in the offices as well as in the works, and our elderly pensioners are pleased to be recalled for short periods.

We find elderly workers extremely conscientious; they are excellent time-keepers, they start work promptly at the appointed hour, need the minimum of supervision, and work right up to the normal finishing time or negotiated finishing time.

We have also what is described as a Long-service Association, and eligibility for membership is twenty-five years' continuous service in the case of men and twenty years in the case of women. The chairman of the company and the managing director make a point of meeting members of the long-service association at stated intervals during the year and keeping them informed of what is going on in the company.

We at our firm would be the last to claim that our successful handling of the older worker problem derives in any way from some magic formula. It is simply a matter of common sense, of never forgetting that a real skilled craftsman is still worth his weight in gold, and of realising that what age loses to youth on the swings it often recovers on the roundabouts.

RICHARDSON, I. M., Aberdeen. *Influence of the home on decisions about retirement.*

If we accept the statement that home and work situations are closely related it is reasonable to ask what factors in one are likely to affect the other and what is the *modus operandi* of each. To this a factual answer is almost unknown, though it is not difficult to offer speculations as varied as they are reasonable. My own interest dates from 1951 when, during a study of older men in heavy industry [illegible] influence of [illegible] ligl[illegible] after absence from work due to illness or injury. That a man in his 50's or around 60 should discuss with his wife a job change likely through lower pay and prestige to affect his home is not surprising, but it drew my attention to the importance of looking at *both* home and work situations for understanding of these retirements from heavy work—I use the word retirement deliberately, because it seems probable that similar considerations often apply to retirement in the usual sense of that word.

I must leave aside the difficult question of the nature of work [illegible] "mental" [illegible] f simply as [illegible] nse is very [illegible] work, *e.g.*, [illegible] Many [illegible] from work. In my own study several men mentioned that their wives encouraged them to seek the transfer on return to work, while it was clear from the remarks of others that the work situation was often a matter for discussion in the home.

In search of further clues to this interaction between home and work I have recently completed a small pilot study of thirty-six men aged between 30 and 64. First an interview was held at the place

of work and a few days later a health visitor interviewed the man's wife at home. The few findings which I wish to report here are *clues*, not conclusions—the data is inadequate and difficult to analyse, but I trust you will discern in what I have to say some support for my general thesis.

Case 1—A. P., aged 52 years. Thirty-six years' service with firm; unskilled labourer. When aged 51 he was off work six weeks through illness. On return to old job he felt easily tired, though his mates relieved him of heavy lifts. At home interview, wife seemed very concerned about husband's tiredness and showed resentment that "at his age" he should have such a heavy job, and for a "poor

Comment—This man's job is not heavy—no speed pressure, no

his.

Case 2—R. L., aged 53 years. Thirty-two years' service. Rose from unskilled to semi-skilled charge hand. At age 52 was off work one year with pulmonary tuberculosis. Expected and wished to return to old job, but this was forbidden (medically) as being too heavy; *he grudgingly accepted a warehouse job which was light and where he could use his experience. Glad to be re-employed but openly*

Case 3—W. G., aged 62 years. Skilled operative, forty-seven years' service. At age 61 was off five weeks with general debility, largely due to wife's invalidism from bronchitis and heart failure. He has had to help at home for years (a married daughter helps

I cannot at present tell you how frequent such cases are in a community—that question I hope to answer in about three years—but we do know from Dr Sheldon's Wolverhampton survey that in *the pensionable age groups domestic strain due to ill-health is a* common visitor, and it is surely reasonable to suppose that its presence may create or aggravate work difficulties. Moreover it is now clear that the problems of work and age arise earlier than age 65, and that we must, therefore, look at the 50's or even earlier if true preventive measures are to be sought and applied. It is

tempting—I have not resisted—to generalise from a tiny sample and say that in these age groups attention to the home is necessary too—but I leave you with at least the thought that home and work are really related at all ages.

SCOTT, W. G., Toronto. *Counselling and placing older workers.*

THE National Employment Service, of the Unemployment Insurance Commission of Canada, is trying to help solve this problem of the older worker. A partial solution is found in the counselling of mature applicants for employment. We in Canada are pleased that our adult counselling service has produced results of a valuable nature. Already seven years old, we have had time to evaluate it.

In Canada we have two distinct classes of applicants who require help. Many of our firms, rightly or wrongly, will not engage persons over 45 years. Some even draw the line at 35 years. So that, in addition to finding employment for the men who have been compulsorily retired at 60 or 65, we have the large group of 45 to 64 years old who also find it most difficult to secure work. Both groups search daily for employment. After a great many refusals to hire they may become discouraged and despondent. In time they begin to feel worthless. They say "Probably I'm through. What's the use of trying further?" Counselling for such persons must mean not only a classification into suitable employment, but it must also mean, and much more important, a raising of their morale. It must have a therapeutic effect. From frustrated, defeated individuals they must obviously become confident and assured persons in order to obtain [illegible] fortune we have discovere[illegible] very thing; it raises their [illegible] in their own ability, not only to secure jobs but also to perform their work satisfactorily.

Literature dealing with older folk stresses their loneliness. We also knew that the older job-seekers were usually frustrated. So, in our dealings with them, we decided that we would be kindly and courteous; we would be vitally interested in them; we would endeavour to be good listeners. What do we mean by a good listener? Mrs Dale Carnegie, in an article entitled "Learn to Listen Effectively," gives three qualifications for a good listener: (*a*) You must use the eyes, the face, the whole body—not just the ears; you must be alert with your whole being. (*b*) You must learn to ask proper questions. One such question at the first interview, "Are [illegible] employment?" [illegible] length. The co[illegible] should never betray a confidence. It is of utmost importance that there be a feeling of trust built up by the counsellor. He is a person who respects others and is interested in them. Consequently, as we have practised these principles we have seen our applicants

change before our very eyes. They came to us despondent, full of fears and worries. Through the therapy of talk in an interested atmosphere, they change into happy, carefree, and purposeful individuals.

[illegible] in d [illegible] con [illegible] item [illegible] do now ?" If our review has been complete, and we have obtained the entire work record, the counsellee is usually in a position to suggest three or four jobs. These are discussed and plans evolved for securing them—or, at least, one of them.

From three studies—two by the University of Toronto School of Social Work—we have discovered that from two-thirds to three-quarters of our counselled applicants secure employment after counselling. Before counselling they had tried repeatedly but failed. [illegible] to do as they liked, they were determined to do the job they really wanted to do. Consequently when they found it, they stayed. This adult counselling service began at Toronto, Canada, some seven years ago and has spread to eight Canadian cities and to numerous other places.

PINGSTONE, G. W., London. *Retirement benefit schemes in relation to the employment of older men and women.*

I MAKE my contribution as an actuary responsible for the administration of a large number of insured industrial pension schemes. Any views I may express are entirely personal.

[illegible] after normal pension age, because they do not grant an adequate increase in pension benefits in respect of service after that age.

1. **Employment of older men and women**—One whole chapter of the first report of the National Advisory Committee on the Employment of Older Men and Women (Cmd. 8963) is devoted to the effect of pension schemes on the engagement and retirement of employees, and this chapter at least should, I think, be read by all concerned with the inauguration and administration of retirement benefit schemes. In my view there is no reason why retirement benefit schemes should provide a bar to the employment of older

workers and, in fact, I think, there are a considerable number of insured schemes which provide no such bar. In so far as the problem may exist, however, in connection with such schemes in Great Britain, the Life Offices'
to the press on 24th July
to help in finding a sol
scheme arranged with them in which there is a suggestion that it limits the freedom of the employer to engage older men and women would be suitably amended. The decision with regard to any such change, however, clearly rests with the employer.

It may be of value to mention that in the statement issued by the Life Offices' associations the following were specifically mentioned as ways in which schemes could be adjusted to facilitate the employment of older men:—

"(*a*) The limiting of compulsory entry up to a specified age, say, 50, with voluntary entry applying thereafter subject to satisfactory evidence of health; *or*

(*b*) Retention of the compulsory provision all through but with the introduction of a later pension age for those entering the scheme at an advanced age in order to make the pension as large as possible and the cost as small as possible; *or*

(*c*) To regard all persons entering after a fixed age, say 50, as temporary staff and therefore ineligible to enter the scheme except by special agreement of all parties."

As a final point in this connection, I would emphasise that in any case the existence of a retirement benefit scheme cannot really be a bar to employment as such, but, at the most, a hindrance to pensionable employment.

2. **Deferment of retirement**—The criticism of retirement benefit schemes on the grounds that they do not encourage employees to

Britain, because it has been common practice under such schemes for many years to grant the employee the full actuarial equivalent of the pension wit
retirement. Th
with a normal r
be increased by
age 70.

In practice there seems little doubt so far as insured retirement benefit schemes in this country are concerned that a considerable

1947 to 1950 inclusive occurring amongst male employees covered by group schemes assured by one large insurance company showed

that for each year approximately one-third represented employees who had deferred their retirement, while for the years 1951 and 1952 the *corresponding proportions were some 41 and 48 per cent. respectively.* A more recent examination of a sample of employees reaching pension age showed that some two-thirds deferred their retirement.

One possible cause of employees being reluctant to defer their retirement is a feeling that if they die in active service or soon after retirement they will have lost pension. This problem is overcome, however, where, as in the case of most insured retirement benefit schemes in Great Britain, the pension is payable for a minimum period, usually five years, even if the employee dies during service after the normal retirement age and before entering into receipt of pension.

As a final point I might mention that the requirements of the income tax or other authority responsible for the " approval " of pension schemes can prove deterrents to employees deferring their retirement, and these requirements should be examined very closely to ensure that any such obstacles are removed.

WELFORD, A. T., Cambridge. *Problems and methods of further research.*

THE primary aim of research on the employment of older people should be to specify work on which they can be employed whole-time at economic rates, without special allowances and with full use of their skilled capacity. From research already carried out it is clear that problems sometimes arise not only among those over minimum pensionable age but among those from 45 to 50 onwards, and that many of the difficulties encountered in the late 60's should be tackled at these earlier ages.

[illegible] 60's and for most in [illegible] A secondary [illegible] of work which makes maximum use of skilled capacity on a part-time basis or with some special allowances.

Some of what appear to be the main questions which would need to be answered in this research are set out below. The list is not intended to be complete and some of the questions are very wide in scope, needing to be broken down further in the course of actual research work. It seems fair to say, however, that all are capable of being answered and that they represent a minimum programme of research required for an understanding of the problem. Some of the questions may be surprising, since answers to them are regarded as common knowledge. Yet before a confident policy for employment of older people could be framed all [illegible]

[illegible]

people, and if so which?

The main problem lies in choosing criteria of suitability. Opinions of management and work-people are not sufficiently reliable to stand on their own without some more factual data. Three types of data may be obtained from records all having some value and some disadvantages:—

(*a*) Surveys of present employment of older people. Provided there is no evidence of special allowances or of restrictive practices such as young people going slow to give the older ones a chance, the fact that older people are engaged on a job is positive evidence of their ability to do it to a satisfactory standard. The absence of older people on a job is not, however, necessarily evidence that they cannot do it.

The argument for using age distributions as a criterion is that a man or woman whose capacity is falling with age will leave the job or be moved to other work rather than carry on at a reduced level of performance. There is a fair amount of evidence that this does, in fact, happen. If there is a policy of recruiting young people the age distribution will, however, be affected by the history of the job—its expansion or contraction over the preceding years, the availability of labour in the district, competition with other jobs, etc. Where such a recruitment policy is absent, the age distribution will be [illegible] :o maintain performance, [illegible] get older—any difficulty [illegible] older people. Although [illegible] ninary information they [illegible]

[illegible]

provided that there is no evidence of restrictive practice and there [illegible] of older people. Broadly [illegible] be discounted only if there [illegible] :he job from the early 40's [illegible] It must be recognised that [illegible] ı placing people on a job, inferences on the basis of production records can apply only to this selected population.

(*c*) Ages at which people move from a job. Probably the most reliable criterion of difficulty for older people is that substantial numbers leave the job at an age earlier than that which is regarded as normal in the factory or district concerned. It must be emphasised that internal transfers as well as people leaving must be considered. The reasons actually given for leaving are often not reliable: *e.g.*, many moves to other work which are probably due to changes of capacity with age are made ostensibly on medical grounds.

Some men and women may, of course, change work in middle age because of promotion, and the most rigorous criterion lies,

therefore, in moves to lower-paid work for any reason other than serious incapacity due to disease or accident. Some people are, however, promoted out of work which they would probably be

them not comparable with other jobs in the same factory. After this preliminary sorting, jobs whose age distribution shows large numbers in the higher ranges can be further examined for changes of performance associated with age; and all jobs, especially those with small numbers of older people, can be compared in terms of the proportion leaving or transferring to other work at a relatively early age.

It should be noted: (1) That it is essential constantly to compare one job or group of jobs with another rather than to attempt to deal with each in isolation. (2) Substantial numbers of people should be included in the comparisons. Occasionally older people can be found whose performance far exceeds the average of their age range, and inferences about average capacity based on one or two older people on a job are therefore unreliable.

2. *Can the features or demands of jobs which make them suitable or unsuitable for older people be identified and defined?*

This is an important aim for research, because unless it can be achieved every job must be examined separately, whereas if definitions of suitable and unsuitable features can be made, specifications in general terms can be set up.

- Visual discrimination under conditions of low illumination or poor contrast.
- Speed of manipulation.
- Work paced by a machine or conveyor at a speed set for younger people.
- Certain forms of complexity.
- Continuous heavy muscular effort.
- Certain special hazards, such as working at heights.

Identification of features in these terms demands a detailed examination and analysis of jobs. Also the features cut across traditional classifications such as "skilled, semi-skilled, and unskilled."

A valuable practical approach is to take such features into consideration right at the beginning of the inquiry and to select jobs for comparison which show the presence or absence of a particular feature in a marked degree, *e.g.*, comparisons can be made of work paced by a conveyor with similar work carried out at a speed more under the operatives' control. Selection of jobs in

this way is likely to save a great deal of work by concentrating attention on those jobs most likely to repay detailed study.

3. *If unfavourable features can be identified, what means can be adopted to remove them?*

It is probable that relatively minor changes in a job could often make it more suitable for older people. This work would seem to fall within the province of the work-study engineer, although due consideration must be given to points listed in (2) above. Some of these points differ from those normally considered by work-study engineers and raise the important further question:

4. *Are all the principles of motion-study which have been found satisfactory for younger people also satisfactory for older?*

[illegible]

might mean the introduction of several changes, one at a time, on a job instead of the usual procedure of making a thorough overhaul of the working method by introducing a number of changes at the same time.

5. *Are there jobs on which more older people could be placed although they are not now employed on them or are employed only in small numbers?*

The answer to this question can be obtained only by making actual experimental trials of employing older people. The selection of jobs should be made in the light of knowledge already obtained in answer to questions (1) and (2). An experiment of this kind inevitably involves some risk, the amount depending upon the accuracy and completeness of the answers to questions (1) and (2) as applied to the job concerned.

6. *Are there some jobs on which it is worth while to employ older people because of lower labour turnover, greater reliability, etc., in spite of their performance being slower than that of younger people?*

One category of such jobs is likely to be that for which training is expensive and where performance does not reach a maximum for some months or years after starting.

The problems under this head are largely matters of costing—balancing labour cost and capital utilisation against costs of training and of spoilt materials.

7. *Is the placement of older people on some jobs restricted by difficulties of training? If so, what are these difficulties, and how could they be corrected? How far is a longer training period for older people justified by lower labour turnover?*

Some leads to the answering of the first and second parts of this question are contained in previous studies of learning in relation to age. The evidence is slight, but such as it is suggests that difficulty

is often due not so much to inability to learn as inability to understand what is being taught because the instruction is either too complicated or goes too fast. The following points appear to deserve further study:—

(*a*) Older people appear to be less tolerant of theoretical than practical instruction.

(*b*) They may sometimes do better with written instructions [illegible]

(*c*) [illegible]

Evidence confirming or denying all these points is needed, together with further suggestions arising from points of difficulty noted in training older people.

8. *Are older people who are unable to support certain jobs full-time capable of an economic performance at the same jobs part-time?*

Some leads towards an answer to this question might be obtained by studying the performance of older people as compared with younger at different times of day and on different days of the week, *i.e.*, does their performance fall off more than that of younger people at the end of the day or week?

The most rigorous and desirable evidence on this question would be obtained by continuing older people part-time at jobs which they were demonstrably unable to support full-time, while [illegible]

should make such a change easier than transferring to an entirely new job.

Studies of particular changes made to jobs either by the intro- [illegible]

Methods of answering these questions—Problems of employing [illegible]

of human performance in relation to age, must bear the main

Much of the basic industrial study can be done, however, not by experimental methods but by the study of existing records. This is a laborious process—much more so than is commonly realised—but it is probably the most suitable method for tackling the first of our questions and can throw light on some of the others. The complexity of the influences which affect the facts which go to make up industrial records makes it necessary continually to guide our scrutiny of them by suggestions obtained from laboratory work. But it is more economical to use records as a check on laboratory results than vice versa.

Most of the other questions demand a method of study which has so far been little used for work on ageing, namely, the direct measurement of performance at work on the shop floor. This is another field in which, as a matter of history, the experimental psychologist has a considerable interest, and is one where patient collaboration between laboratory and industry would seem likely to lead to very significant developments.

CHAPTER X

SURVEYS

I. Critique of Surveys

II. The Sheffield Survey

I. CRITIQUE OF SURVEYS

SHELDON, J. H., Wolverhampton. *Introduction.*

THIS subject is important because in the past, and certainly in the future, so much knowledge of old age, not only in its medical field but also in its social field, has to be obtained through surveys. A survey, however carried out, is really an aspect of the study of natural history, and, as those who are interested in natural history will know, it is a subject which it is very easy to do badly and very difficult to do well. Surveys need to be criticised because if we are to obtain the maximum benefit which can be derived from them it is becoming necessary that the whole of their mechanism and their correlation one with another should be considered.

TIBBITTS, C., Washington, D.C. *Introduction.*

IT is just thirty [illegible] Professor Burgess in the Universi[illegible] Charles Booth survey of life a[illegible] the parent, the great survey in the social science field. I take it as undoubtedly a coincidence, and a fortunate one, that we are meeting at this time in the city in which that survey was made. It is also logical that we should be meeting with people who were responsible for the only two surveys in the field of ageing, so far as I am aware, that are known all over the world. At least, they are certainly known in those countries which are most vitally concerned with ageing.

I refer, of course, to Mr Seebohm Rowntree's report to the Nuffield Foundation, "Old People," and Dr Sheldon's report, "Social Medicine of Old Age." Since those pioneering studies there have been many studies on the phases of ageing; various aspects of it have been studied in many places: adjustment to retirement, health and medical care, nutrition, the activities of older people and their housing and living arrangements.

It is fortunate, I think, that the sampling techniques and the techniques for getting information from people have improved tremendously during recent years. The three investigators whose papers follow have completed surveys in three essentially different areas. One of them has investigated the general conditions and adjustment of older people. Another has investigated the health status of older people, and a third has investigated various aspects of the employment of older persons. Each of these surveys has important conclusions. Our primary interest, however, is in the method of the survey. Are the methods satisfactory for determining the kinds of information that these investigators have sought to get?

BARRON, M. L., Cornell. *A survey of a cross-section of the urban aged in the United States.*

Introduction—What are the effects of occupational retirement in comparison with the effects of other occupational roles in the later

years of life ? This has long been a controversial question in the United States. On the one hand there are those who claim that [illegible]

removed them from the labour force. Similar use is made of the finding that there is a high death-rate in the first year of retirement among the beneficiaries of old age and survivors insurance.

On the other hand there are others who are, at the very least, sceptical of this position. Tibbitts, for example, grants there may be " premature deterioration when retirement deprives the organism and the mind of activity " but, he points out, " declining health is generally a predisposing factor in retirement rather than a consequence. There is a marked inflection in the curve of chronic illness during the 45-55 year decade " (1). In the case of old age and survivors insurance beneficiaries, the high death-rate can be explained mostly by pre-existing disability rather than by the experience of retirement. The healthiest people it is claimed are more likely to continue in employment beyond any age limit in retirement systems such as 65. Conversely, those who retire do so largely because of poor health. It may well be that many people who die soon after retirement succumb to conditions which would have induced death even if they had continued in gainful employment. The chief actuary of the Social Security Administration, United States Department of Health, Education, and Welfare, recently came to virtually the same conclusion on the basis of his analysis of comparative mortality records. He said in summary (2) :—

> Analyses of the mortality experience under various govern- [illegible]
>
> healthier individuals continue at work.

In short, sceptics suggest that the ætiological sequence does not operate in terms of retirement leading to physical and mental morbidity; rather, physical and mental morbidity are more likely to lead to retirement.

Nevertheless, the belief that retirement has a lethal influence persists. In rebuttal its proponents say it may be difficult to ascertain the effects of the sudden cessation of work, but it cannot be denied that mental and emotional conditions affect the organism. Thus it is conceivable that the shock of retirement and anxiety about

successively higher age categories. Even though the sex ratio of the American population as a whole 60 years of age and over is preponderantly female, 77 per cent. of the sample were males for reasons already given. Over half of the people interviewed (58·6 per cent.) were married and living with spouse, the others being widowed (30·7 per cent.), divorced (1·2 per cent.), never married (6·4 per cent.), and separated (2·5 per cent.). Like the population in general, the sample was composed largely of white (87 per cent.), negroes constituting the next racial group in size (10·7 per cent.). The majority of the people were Protestant (65·3 per cent.), while others were Catholic (24·2 per cent.), Jewish (4·8 per cent.), and other religious affiliations or unaffiliated (2·4 per cent.). An even larger proportion (71·8 per cent.) was native-born, whereas the foreign-born constituted slightly more than one-fourth (27·5 per cent.) of the entire sample.

The people interviewed lived in all regions of the United States. The largest proportion lived in the East North Central States (21·6 per cent.); others were found in the Middle Atlantic region (20·9 per cent.), New England (12·5 per cent.), the West North Central (11 per cent.), the South Atlantic (10 per cent.), the Pacific (10 per cent.), and the East and West South Central and Mountain regions (4·3 per cent. each). Those who resided in large cities were more numerous than the others (28·2 per cent.), followed in order by the ones who lived in small cities (25·9 per cent.), metropolitan centres (24·5 per cent.), small towns (16·5 per cent.), and lastly, large towns (4·7 per cent.).

In a self-rating of their family's social class, over half of the sample (59 per cent.) considered themselves to be of the working class. The middle class made up slightly less than one-third (31 per cent.) of the group, and the upper and lower classes each comprised 4·3 per cent. The formal education of the sample was geared toward the lower level, a reflection of the early educational pattern in American society. More than one person in twenty (5·5 per cent.) had no education, and over one-third (38·4 per cent.) had only one to seven grades of schooling. One-fourth (25·4 per cent.) were grammar school graduates; an eighth (12·9 per cent.) had some high school experience. On the other hand, only seventeen of every hundred were high school graduates or better.

Occupational status—The occupational status and role of every respondent was identified in terms of the following classificatory scheme: (*a*) Those who were employed at what they considered to be their "regular" occupation (27·9 per cent.); (*b*) those who were employed at something other than their "regular" occupation (12·8 per cent.); (*c*) those who were unemployed and who did not consider themselves retired (4·9 per cent.); (*d*) those who were not employed and who considered themselves retired (36·9 per cent.); (*e*) housewives living with their husbands (5·4 per cent.); and lastly (*f*) housekeepers who were single, widowed, divorced, or separated (11·8 per cent.).

[illegible] will be [illegible] onomic, [illegible] *But first* [illegible] pational status and roles of the people interviewed and some of their social and demographic traits which have already been summarised. What, for example, was the age distribution of the sample in terms of their occupations ?

The most important feature in the age distribution of the various occupational categories was the marked differential between the *two employed categories and the two unemployed categories.* The fact that the unemployed aged in general were chronologically older than the employed people obviously could have been a significant factor in accounting for economic, psychological, social, and health differentials revealed by the survey. Therefore a control on the age factor was clearly called for in dealing with the data whenever there was suspicion that chronological age was significant.

In sex distribution, of course, the occupational categories varied considerably. Most of the females were automatically concentrated among the housewives and housekeepers, but they also appeared to a small extent in the four other groupings. They comprised 7 per cent. of those employed at their regular occupation, 4 per cent. of those employed at something else, 13 per cent. of the unemployed who were not retired, and 6 per cent. of the unemployed who considered themselves retired.

In marital distribution the most interesting and significant [illegible] of the employed aged and the two [illegible]

unemployed and retired and 37 per cent. of the unemployed but not retired were married; widowhood constituting the marital status of most of the remaining unemployed aged.

The racial, religious, and nativity distribution of the occupational categories of the aged seemed to show that older negroes, Catholics, and the foreign-born were handicapped more than older whites, Protestants, and the native-born as far as success in remaining in [illegible] was concerned [illegible]

of the unemployed but not retired (14 per cent.). All occupational categories included some who called themselves upper class (ranging from 3 per cent. of the unemployed and retired to 7 per cent. of the

unemployed but not retired). In lower class self-rating, however, there was none of the people employed at their regular occupation, the others ranging from 2 per cent. of the housewives to 9 per cent. of the housekeepers.

That the underprivileged older person is more likely to be found *in the unemployed categories than his more privileged counterpart* was further substantiated in the educational distribution of the occupational groupings. There was an over-representation among the unemployed by those aged whose educational level was low and an under-representation among the employed categories on that level. This fact, along with the larger proportion of widowers, ethnic minorities, the foreign-born, and lower social class affiliation among the unemployed aged must be taken into account in any final analysis of the relationship between occupational status and role and the effect variables.

The effects of occupational status in old age—With these preliminary considerations in mind we can turn to the survey findings regarding the effects of occupational status and role. First, what [illegible] effects? In [illegible]

of occupational status, hypotheses posing a greater advantage for the employed statuses over the unemployed statuses were verified *by the findings. This obviously was not as revealing as the findings* about the psychological effects. In attitudes toward life, the self-image, and feelings of segregation, inferiority, and prejudice by younger people, the unemployed aged (especially those who did not consider themselves retired) were the most negative of *all* occupational status categories. This was found to be true even when chronological age was held constant. The survey data on the social effects of occupational status and role in old age for the most part were consistent with those on economic and psychological effects. Not only did the unemployed aged experience discrimination when they sought re-employment but they were *more isolated in their social relations than were the employed* aged. Their advice was reported to have been sought less frequently by others, they had fewer close friends, and they were more passive about the future. Furthermore, the unemployed aged showed more signs of decline in activity than did their employed counterparts.

[illegible] the unemployed aged may be said to have more "quasi- [illegible] an [illegible] he [illegible] ey [illegible] ve [illegible] er [illegible] ler [illegible] ic [illegible] idleness to which they have been relegated, have the most emphatic

minority-group reactions of all occupational categories of the chronologically aged.

Our primary concern, of course, is the relationship between occupational status and role in old age and the *health* of the urban aged. The remaining discussion, therefore, will deal with the findings on health.

Self-rating of health—Each of the respondents was asked: "How *would you rate your health at present?*" *Implicit in this question* was the hypothesis that there is a positive correlation between the more active occupational roles in old age and superior self-ratings of health; conversely, it was hypothesised that there is a positive [illegible]

[illegible] rated their health as poor or very poor to a greater extent than did the people in the other occupational roles of the aged. Intermediate in the self-rating of health were the housewives and housekeepers.

Dynamics of health—To secure data about a related matter, the dynamics of health in old age, the respondents were asked: "Was your health better when you were 50, or is it better now?" It was hypothesised that deterioration of health in old age is most extensive among those whose occupational roles are relatively passive, and least extensive among those whose occupational roles are *relatively active. In short, the expectation was that retirants and* the other unemployed aged would report significantly greater deterioration of health than those who were employed—either at their regular occupation or at something else—and housewives and housekeepers.

The majority of the sample as a whole (56 per cent.) said their health had deteriorated since age 50. Significant differentials in the distribution by occupational status were in general conformity with the hypothesis. Even though housewives and housekeepers claimed "better health now" to a greater extent than did the other urban [illegible]

aged and the unemployed [illegible]
retired maintained that their health had deteriorated the most. *There was no indication in these findings, of course, that the health of* these people had deteriorated *because* of their occupational status and roles.

Problems of physical health—Specifically what are the health problems of the urban aged? To what extent are they physical

problems and to what extent are they mental and emotional problems? The respondents were asked, first: "Do you have any physical health problems at present?" The hypothesis was that the employed aged have proportionately fewer problems of physical health than do the less active aged.

In the entire sample, over half (53 per cent.) claimed to have no particular physical health problems. Among the 47 per cent. who had, the physical problems independent of age were the most frequent, followed by those directly associated with ageing. The distribution [illegible]

However, it is necessary to take note of some variations when chronological age was held constant. For example, among those who were 60 to 65 years of age, the unemployed who did not consider themselves retired appear to have been no different in this respect from the people employed at their regular occupation. But the people in this chronological subdivision who considered themselves retired surpassed all of the other aged to a striking degree as far as having physical health problems are concerned. One can deduce from this that if people under 65 consider themselves retired, poor physical health is the outstanding reason in most cases for their relatively premature occupational passivity.

Problems of mental health—To determine the extent of their problems of mental health the urban aged were asked: "How often are you troubled by the following difficulties—physical aches and pains, nervousness, headaches, forgetfulness, not being able to sleep, and upset stomach?" The hypothesis implicit in this question was that the aged who are engaged in the more active occupational roles are less often disturbed by psychosomatic symptoms than are those who are more passive occupationally.

The overall findings showed the majority of the urban aged were troubled at least "sometimes" by physical aches and pains, nervousness, and forgetfulness. Although less than half claimed to have headaches, sleeplessness, and upset stomachs at any time, it is [illegible] more [illegible] gain, [illegible] olled by chronological age, supported the hypothesis in most respects. The aged who were employed usually had fewer and less frequent [illegible]

aches and pains, headaches, and sleeplessness than were the unemployed who considered themselves retired. Possibly the inability of the former to accept the status of retirement disposed them to such disturbances to a greater extent than the latter, who had accepted that status.

SUMMARY

In summary, our nation-wide urban survey of a cross-section of the American population 60 years of age and over has demonstrated that the economic, psychological, and social correlates of the occupational statuses and roles of old age are in turn correlated with significant differentials in physical and mental health. Those aged who have the most pronounced "quasi-minority" characteristics also have the highest incidence of physical and mental morbidity. Conversely, the aged with the least pronounced "quasi-minority" characteristics are marked by the lowest incidence of poor health.

CONCLUSION

But correlations such as these are not necessarily ætiological relationships. There is still no basis for assuming that poor health in old age is primarily a dependent variable of occupational status and role. While it may be reasonable to infer such a relationship, it can still be argued that in many cases poor health in old age is [illegible]

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VAN ZONNEVELD, R. J., Groningen. *Medical and social sample survey of the aged in the Netherlands.*

IN 1951 it was suggested that a large socio-medical survey should be carried out in the Netherlands. The object was to obtain an insight at a given moment of time into, first, the functioning and the disorders, if any, of some important sense organs and other organs, and of the mental capacity and memory of old people. This information was to be obtained by questions and by some simple tests.

The second object was to discover how far the elderly adjust to their defects in certain important daily tasks. Finally, it was proposed to try to divide those who were examined into five groups according to their state of health and to the socio-medical provisions of which they were considered to be in need, without taking into account their existing social circumstances.

The survey was carried out under the ægis of the Institute of Social and Preventive Medicine in Groningen, a town of 140,000

inhabitants. Many farmers and labourers come to live in Groningen after retirement and there are also many industries there, so that the composition of the aged population can be considered as well diversified.

To obtain an adequate sample, 3,000 persons of 65 years and over were visited—a quarter of all the aged persons in the town. These

years and over).

It is best in the field of clinical or social medicine to use a physician as the surveyor rather than an almoner, nurse, or case worker. These latter are of great use in assisting the doctor, but they must often miss the medical basis for their conclusions. In the Groningen survey medical students in their final year before State examinations carried out a great deal of the survey work. The rest of the work, consisting mostly of the difficult cases, the ... was done by myself. We

they had been warned in advance by a special letter explaining the object of the survey, earnestly asking for their co-operation and announcing the date of the proposed visit.

In many cases the first attempts to interview the old persons were unsuccessful because they were out of the house or had moved to another address, but in the end all these persons were contacted at home or at their new addresses. Those who had died or left the town for good were excluded. In all, only thirty-six persons refused to co-operate, and even about them we got information from relatives or physicians.

... with old ... or unable ... methods. ... gain their

... had few examples to guide us but we sought advice from many people of experience. A pilot study of 200 old people preceded the survey proper. A number of the most important findings may be mentioned briefly.

... found in the higher soci ... ple have to live ... figure was 8 per cent., but for the age group of those of 80 and over it was 40 per cent. There was no significant difference between the two sexes.

It is important to know something of what the old people themselves think of their state of health. We found that in every age

group more than 80 per cent. of all men did not complain of their health. About 13 per cent. found their state of health tolerable and only 2 to 4 per cent. really complained. For women the figures were, respectively, approximately 74 per cent., 20 per cent., and 4 to 8 per cent. ... l of their ... of those ... Between the higher and lower social classes there was no significant difference in feelings about health. An important finding was that men who were still working complained less than those who had stopped working. There was no correlation between widowhood or widowerhood, nor the number of children, and the old persons' opinions about their health.

Constipation was frequently complained of by many of the old persons. The percentage of men not complaining of it decreased from 82 per cent. in the youngest age group to 66 per cent. in the oldest group. For women the respective percentages were 68 and 56 per cent. There was a significant increase of these complaints with age and the difference between the sexes was also significant.

Women, especially of the two oldest groups, also complained more of the sense of suffocation than men, but there was no increase of the complaint with age. In both sexes the highest social class complained less of suffocation than the other classes. Shortness of breath, while resting as well as during exertion, occurred significantly more in women than in men. The two complaints, dyspnœa and a sense of suffocation, occurred often in combination.

Men were more troubled by micturition complaints than women. Nycturia and dysuria were the troubles most mentioned. In the youngest age group, about 50 per cent. of the men and about 37 per cent. of the women were free from all major troubles, while in the oldest group these percentages were 40 and 27 per cent. Significantly more women than men had probable cardiovascular diseases, but there was no especial difference between the sexes in relation to the ... cent. of the ... it spectacles. ... cent. of the ... 80 years of age only one-quarter of all the old people who were examined had no complaints about hearing and sight. Complaints about hearing were not so frequent as with sight: in the oldest group, 26 per cent. of the men and 32 per cent. of the women had perfect hearing. More women than men complained of defective eyesight, but more men than women of defective hearing.

Ten per cent. of the aged had complaints referable to the arms and 16 per cent. to the legs; there was no significant difference between the sexes. Œdema and varices were commoner in women. Disturbances of micturition were a significant accompaniment to leg complaints.

Approximately 40 per cent. of the aged had been under treatment by a physician within the three months before the inquiry was undertaken. Advancing age was of no significant influence on this percentage with women; it was for the men beyond 75. There was [illegible] siderable number of aged persons not suffering from illness nevertheless used household remedies.

Few attempts have been made up to now to measure the mental capacity of the elderly. Such tests as have been done have been applied only to small groups or to those not over 70 years of age. Moreover, the tests have nearly always been those used for much younger people. It is obvious that the composition as well as the standard of mental tests for older persons should be different from those for younger ones.

In the Groningen survey we tried only to get an insight into the functioning of the memory. A battery of questions from the Wechsler Memory Scale was used, adapted to local circumstances and to the age of the persons being tested. The evaluation of the marks obtained had to be altered, and not much stress was laid on speed. We were very cautious to explain the nature of the test. There were some refusals, but for the most part these concerned only some parts of the test, such as repeating a story or the reproduction of two drawings. It was interesting that it was the men who refused the former more often and women the latter, but more than 85 per cent. of all the aged did the whole test. The higher social classes tended to score better than the lower classes. This was particularly the case with the general orientation questions, the alphabet test, the arithmetical problem, the auditive, and the visual memory tests.

This presents a difficulty, which is the same as with younger persons; but if we want to test older persons—for example, for ability for other jobs—we shall have to remember that previous careers can have a great influence on the results. There was a tendency also, though less pronounced, for those who were still working to obtain better results than those who had retired. In the younger age groups men scored higher marks than women.

Some difficulties and desiderata with regard to the testing of the mental capacities of the aged may be summed up here:—

1. The composition of the tests should be different from those for younger persons—for instance, with respect to speed and experience.
2. The tests should be performed with all age groups in order to get a good comparison, and, if necessary, different standards should be accepted.
3. The influence of social standing should not be overlooked, even when using simple tests.
4. Special care should be taken to secure the co-operation and attention of the aged to be tested.

'eyed did not like
sing age there was
but with women
r of a home. In
general, women appreciated the idea of such homes more than men.

Disregarding for a moment the personal wishes or material circumstances of the old people, we found that if all who needed institutional care were to receive it, there would have to be in Groningen 153 beds in homes for the aged per 1,000 of the population aged 65 and over, thirty-four beds in nursing homes or special homes for the mentally infirm aged, and 4·3 beds in general hospitals. We found that only 1 per cent. of those receiving institutional care did not really need it, whereas 3·7 per cent. needed but had not obtained admission to an old people's home and 1·1 per cent. to a nursing home. About 3·7 per cent. needed home helps.

The findings summarised here are for the most part not very surprising, but they can form the basis of further inquiries. The aim of all investigations and efforts in this field should ultimately be the well-being of the aged, so that people may be happy in their old age.

MOSS, L., London. *A sample survey of older people and their employment in Great Britain in* 1950.

Most social issues impinge on many aspects of social life: they are multilateral in their effects and also in their origins. Thus, a dominating social issue in recent years has been the cost of living. In fact, the cost-of-living problem is a complex of many problems. Amongst these are earning power and the factors which affect it; patterns of living or the insistence of certain sections of the population on certain preferred forms of feeding, clothing, or housing; and

of demographic trends, engineering developments, and preferences for particular types of housing accommodation.

You will notice that in both these issues I have drawn attention to the fact that the social issues involve a technical problem, an attitude or opinion problem, and a sociological problem. This is the case, too, with the social problem to which this conference is

public attention. In these cases, solving the practical problem involves some attempt to weigh the different contributing factors and to discern the pattern of influences which are at work.

I would like to suggest that much of our interest in old people and the ageing of the population crystallises in a very practical problem which is of great political significance and perhaps likely to be of increasing concern in many countries. I refer to the extent to which older people remain in the labour force—that is to say, the productive forces of the country.

General considerations—My paper is concerned with one study of the factors involved in the employment of older persons in Britain. It was a study made for our Ministry of Labour at a time when the question was beginning to secure increasing public interest. Now, as with other major social issues, the problem here is a complex resultant of many forces. Clearly the ability of older people to continue working is related to their state of health. It is also related to the tasks which they are asked to do, and this involves considerations of technological processes and the demands which machines make upon those who man them. We are immediately involved in questions of technique. But changes in technique depend upon the willingness of those who make decisions to change the production processes which they control. Such changes depend, therefore, upon the attitude of employers and their willingness to change their organisational set-ups. [illegible] of other sections of the [illegible] as well as the general [illegible] changes in technical organisation when it is economically possible or profitable to do so. It is easier for employees in the younger age groups to accept increasing numbers of older people remaining in the labour force under conditions of full employment than when there is unemployment. Now we do not know a great deal about any of these individual factors and therefore it would not be expected that any study made in 1950 could produce any final conclusions. What we tried to do was to survey the scene broadly and to get some first approximate measures of the relative weights of the contributing factors which were at work. We were able in the course of this study only to begin to bring the factors together and discern the rough outlines of the pattern on which any major policy decision would have to rest. It may be the case that even to-day not enough is known to mark out the full pattern of influences which are at work.

The method—We interviewed in all 1,950 men and 482 women between the ages of 55 and 74. They were selected from our comprehensive National Register, which is no longer in existence, but they were a fully representative sample. We interviewed the representatives of 923 firms employing ten or more employees registered with the Ministry of Labour in Labour Employment Exchanges in fifty exchange areas. We interviewed a small sample of 294 unemployed men in order to discover whether there were any particular characteristics of men unemployed during a time of full employment which might be related to our primary interest in the effects of age on employment.

I will present some of the main findings of the inquiry very

shortly, commenting in the process and in broad terms on their significance for the main problem which arises in considering the employment of older people.

The incidence of employment amongst older people—At the time of the inquiry 60 per cent. of men and 9 per cent. of women between the ages of 50 and 74 were working full-time, and further small proportions were working part-time. Comparisons with earlier studies showed that since the end of the war there had been a sub-*stantial decline in the employment of older men. We found that* the older people who were working were more heavily represented amongst managerial and unskilled workers and much less heavily represented amongst the manipulative workers and operatives than

firms with nine or less employees than in the larger firms.

The survey, therefore, drew attention to the fact that to some extent there is an occupational bias in the employment of older people. It remains to be seen whether this bias is due to the needs *of the occupation or to decisions made by the organisers of industry* related to other circumstances.

The retiring age—We then turned our attention to the factors which appeared to be associated with retiring age. We found that

minimum age for retirement pensions. For many of these men their state of health, their financial resources, the conditions under which they worked, and other factors had combined in their varying proportions to induce them to give up work before the general statutory retiring age. It is interesting to note that analyses by *industry and occupation showed that there were no marked* differences in the age at which men gave up their jobs in different industries or occupations. The implication of this could be that

employees had been employed in, or were employed by, firms with a retiring age, and 30 per cent. were employed in firms where some kind of superannuation scheme was in operation; but it is quite clear that superannuation schemes worked with very varying effect *on different sectors of working forces. Different policies appear* to be operating for employees, office staff, and senior executives.

scheme was in operation compared with only 14 per cent. in smaller firms. It is difficult to assess the effect of retiring ages or superannuation schemes on retirement, because such schemes are not applied evenly over the population or even inside the same establishment. Employers make exceptions to these schemes for their own reasons: some grades are exempted and in other grades retiring ages are enforced.

Length of work life—Some attention was given in the survey to the effects of health and work strain. It is a useful introduction to any such consideration to realise that by the time men had left their full-time occupations, at least 25 per cent. had been at work over forty-five years. Of the men in our sample who had given up full-time work, 35 per cent. of those between 65 and 70 had been forty-five years or more in their last full-time occupation, and 40 per cent. of those who were over 70 when they gave up work had spent forty-five years or more in their last full-time occupation. These figures must be borne very much in mind whenever one considers the technical possibilities of prolonging working life.

It was noticeable that the number of years people had spent in their full-time occupation varied sharply with the kind of job done. Thus those in professions and higher technical jobs had spent an average of nearly forty years in the last full-time occupation; operatives just about twenty-eight years on an average, whereas unskilled workers had spent on an average just under nineteen years in their last full-time occupation. These figures, of course, do not indicate the period of stay at the same firm, but rather the time spent doing the same kind of work in one or more firms. Even so, a considerable proportion of people had spent very many years with one firm. Twenty-eight per cent. of men still employed at the time of the inquiry had spent more than thirty-five years with the same single firm at which they were still working. On the other hand, 18 per cent. of the sample, who were all over the age of 55, had spent

the age of 50 amongst unskilled workers and manipulative workers than amongst operatives and professional and technical workers. These findings obviously have relevance for the suggestion that job changing in the later years of employment might be a way of prolonging the working life. Clearly men who have spent long years

about two-thirds of those over the age of 55 who were still working said they did their work with no sense of strain, and in fact those between the ages of 60 and 64 did not appear to feel strain in larger numbers than those in the ages 55 to 59; but the figures went up sharply in the five years 65 to 69. Obviously the nature of the work done must have some effect on the degree of strain felt. We classified the types of activities carried out on a scale giving an indication of the amount of strain involved. Those who were employed on heavy labouring work, most of whom were operatives and unskilled workers, asserted that their work was a strain more than twice as often as those in other groups. If one took that third of the sample which asserted that the work being done at present was a strain, it is very interesting to note that, whereas the majority of those engaged in heavy duties attributed the strain to the nature of the work, the *majority of those engaged in relatively light duties attributed the* strain to their own physical condition. It seems as if those engaged in different types of work set their own standards of the kind of effort required for the job and then assess their own activities against this standard. A man engaged in heavy labouring work finds himself involved in the need for effort to cope with particular physical tasks. It is, therefore, natural for him to attribute any sense of strain that he feels to the demands of the work, whereas those engaged in relatively light duties think more in terms of their own physical deficiencies.

Attitudes to work—The other major factor involved in the complex of problems which crystallise in the employment of older people is, of course, the psychological factor: how people themselves feel about remaining at work after the statutory retiring age. This is a very tangled subject because obviously people's desires are very interwoven with their needs. We found, for example, that those who were under the age of 65, in the main, asserted they worked because they had to do so, because otherwise they could not find the resources to live. Over the age of 65, however, people said in much *larger numbers that they* worked, not only because they must, but *also* because they preferred to be occupied. There did not appear to be any gross variation between the motives given for working and the statements about health which those who were [illegible]

periods, "As long as I can," or "As long as I feel like it." Clearly, over the age of 55 the majority of people feel uncertain about the physical possibilities of their going on. When we asked people whether they thought there was anything which might prevent them from going on working, the reply which dominated all others was the possibility of ill-health, which was mentioned by 70 per cent. of the men and 61 per cent. of the women.

A return to work—Some indication of the extent to which people

are urgently concerned to work after the statutory retiring age may be found in the figures of those who, for some reason or other, had to give up a paid job at 65. When they were asked whether they would return to full or part-time work if they had the chance to do so, only 19 per cent. of the men and 5 per cent. of the women asserted that they were willing to return to full-time employment. The figures mount to 37 per cent. of men and 20 per cent. of women if part-time work is included, but of these numbers only 20 per cent. of the men and only 3 per cent. of the women had actually tried to find work since giving up their preretirement job. It would appear from this that whatever the cause or combination of causes which lead to people having to leave paid jobs at the statutory retiring age, only a very small minority make practical efforts to find employment

back.

Employers and older workers—It seemed important to get some information about the state of mind of the employers since, from the information presented so far, it appears to be the decisions made in individual firms which decide whether particular individuals continue working or not. It was clear that employers had different opinions about the employability of different kinds of workers. Asked to give a general opinion on the employment of men and women over the age of 45, employers were in favour of such employment being given rather more in the case of skilled workers than other workers. About half only of the employers in the sample covered were in favour of employing older persons: a large group were dubious, but only a comparatively small proportion definitely antagonistic to the idea. The proportion in favour does not apparently vary very greatly between industries, but it appears that the proportion of large firms ready to employ older persons is somewhat below average in the case of staff than for skilled workers. Some attempt was made to bring this question out of the realm of " opinion " into " fact " and employers were asked what their recent practice had been in the case of their own firm. It appeared from this that there were many fewer openings for staff than for operatives over the age of 45, and the proportion of employers regularly engaging staff declined very greatly with each age group. Thus, whereas 43 per cent. were regularly engaging operatives between the ages 45 to 49, only 24 per cent. were regularly engaging them at ages 55 to 59 and the figures declined sharply after that age. It therefore looks as if employers set their practical limit at the age of 50 years at most. The industries most favourable, from these figures, to the engagement of older persons were those in metals and commerce. Firms with 100 employees or more engaged a lower proportion of persons age 55 and over than might be expected. There seems, however, to

be a sharp difference between the willingness of employers to take on older people and their willingness to retain in their employment those who are already with them. Employers appear to be much more willing to retain than to take on. Asked to say what they thought were the prospects of using elderly workers in their own particular field in the future, one quarter of all the employers interviewed thought there were no prospects at all; a similar proportion thought the prospects were good for such employment, and another quarter thought the prospects were good if the older workers were already on their staffs. It seems from this information, therefore, that whilst there is a limited amount of goodwill about the idea of continuing the employment of older workers and taking on older workers amongst considerable numbers of employers, the prospects do not [illegible]

[illegible] from representative samples of broad groups of the population. The main contribution of such data is to show whether there are broad national factors or broad industrial or broad sociological group factors at work in the problem, but it has to be pointed out that only when the factors are sufficiently dominant to be statistically significant in a representative sample are they likely to be thrown up by this method. Obviously small local factors or factors which affect particular small factories or industries, or particular small [illegible]

[illegible] the employment of older workers in a section of a particular industry or throughout a particular occupation.

Another strength of the sample survey method arises out of the [illegible]

[illegible] what amounts to a parallel to experimental situations. Thus we can compare within our sample the leaving age and other conditions of those employed in firms with superannuation schemes and those [illegible]

relative contributions made by many different contributory factors to the special problems centring around old age.

I do not think that the study here reported goes very far along this road. The sample survey approach builds on work which has been done by previous students in the field. Many small-scale and specialised studies are needed in order to draw out those factors which it is most worth while to build into the design of a sample [illegible]

stage, then the design of the sample survey can be made in such a way as to test or reject very many hypotheses within the framework of one study.

Clearly in this particular study we were forced to rely too heavily [illegible]

future studies; it would be desirable to collect much more detailed information about the economic resources available to older people reaching the statutory retiring age; it would be desirable to go beyond the opinions of employers on the employability of older people and to find out what there was about the actual physical demands of a series of jobs which made the employment of older people practical or not. Perhaps most important of all, it would be most desirable in such a future study to find out to what extent general economic policy in such matters as full employment affected the attitudes of both employers and work-people on the possibilities of employment beyond the present statutory retiring age.

I believe that the representative sample survey can collect the detailed information necessary for an all-round appraisal of the problem and that the representative sample survey is perhaps the only way of collecting all the information in such a form that the relative contribution of different factors can be adequately assessed and the pattern which they make discerned in a valid way. The [illegible]

ABRAMS, M., London. *Reflections on survey techniques.*

THE three papers to which we have just listened are excellent demon- [illegible]

Over the past fifty years governments everywhere have come more and more to shoulder responsibility for the basic welfare of the individual citizen. In exercising this responsibility it was soon realised that good intentions and deductive theories about human behaviour were inadequate for the new tasks. The administrators

occasional population census, these facts were almost entirely absent. It was to meet this lack that the social survey was invented. Since then it has flourished greatly, and no substitute has yet been found for the survey as a tool for acquiring facts.

Like most inventions, the first models were far from perfect. To-day we are still looking for improvements but at least wide agreement has been reached on what are some of the essential characteristics of sound surveys. We can list these as follows: First, the facts sought should be obtained directly from the people concerned. If we want to know about the housing conditions under which old people live and would like to live, we must visit them in their homes and ask them.

Second, the facts required can be obtained on the basis of a random sample. Information gathered in this way from 3,000 old people can be, for all practical purposes, just as reliable as that provided by 3,000,000 old people.

Third, the facts should be obtained under "controlled" conditions. That is, the same questions in the same sequence should be put to all respondents by interviewers who have received a

attention they deserve.

the question, "Is your health better or worse now than when you were 50 years of age?"

The second neglected maxim is that respondents should not be expected to provide highly technical information. It is not unusual for general practitioners to send patients off to hospital with a completely wrong diagnosis. This by itself should be enough to warn us not to take too seriously the answers given to such survey questions as, "What ailments have you had in the past twelve *months?*"

Thirdly, respondents should not be expected to be able to forecast accurately their behaviour under hypothetical conditions, especially where those conditions may include group pressures that run counter to individual attitudes.

The fact that many surveys have included questions along these three lines—that is, have called for considerable feats of memory, knowledge, and imagination—is, however, a sure sign that we do need answers to such questions, and, indeed, need them badly. But undoubtedly more sophisticated survey methods are required in place of the blunt question. For example, to replace memory questions we might profitably develop the sort of longitudinal [illegible]

unsuccessful, to ageing are recorded without recourse to memory. One unique advantage of the longitudinal survey is that it provides information about those who fail completely to adjust to old age, namely, the people who die before reaching old age.

A possible means of dealing with the need for highly technical information about respondents lies in augmenting the typical research staff with specialists who can validate the accounts given by the members of the sample.

Finally, as a substitute for research by hypothetical questions, we might well add to our surveys of old age some of the techniques which by now are fairly commonplace in other fields of social research. For example, I think more use could be made of the method of differences; that is, the comparison of control and test groups which are identical in all but one factor. Again, more use could be made of the statistician's tool of factorial analysis and the scaling techniques developed in particular at Cornell University.

These, however, are not the only modifications one would like to see in survey techniques. They can be regarded as corrections of past errors, but I have the feeling that, in fact, we are to-day at a crucial point in the development of old age research by survey methods. We are in danger of merely multiplying our stock of familiar facts, and the time has come for a drastic widening of our methods. I would suggest the following for consideration.

First, hitherto, statisticians and medical men have tended to have a monopoly of the planning, direction, and interpretation of surveys. I believe that research would be much more illuminating if these tasks were shared with experts from other fields—sociology, economics, architecture, government, and even history. Such a multi-discipline approach might well enrich surveys concerned with the employment of old people. The historian would appreciate that the propensity of ageing workers to prefer retirement to continued employment is not a recent tendency. At least in this country it has grown steadily since the 1880's, and a secular trend of that duration is not likely to be reversed quickly. The economist would realise that a rapidly increasing proportion of retired workers comes from clerical and office occupations. Unlike earlier generations, they lack manual skills which can be used in retirement. The pensioned clerk often has little more to build on than a skill whose

standing of the fact that the work situation is a social situation *wherein the individual seeks emotional support from his fellows,*

adjustment to old age.

A second valuable development might well be a considerable widening of the age span normally considered in old age surveys. This has a twofold advantage. It is a commonplace of popular philosophy that nothing happens to a man that he does not do to himself. If this is true then much that happens, for good or for ill, to a citizen in old age is latent in him in childhood and early manhood, and those are then the years during which his fortunes in old age can, perhaps, best be studied and shaped. A second advantage of these extended surveys springs from the fact that they provide an essential basis for comparison. The statement that "a majority of the urban aged are troubled by psychosomatic symptoms" only acquires significance if we know the incidence of

social action. We tend to neglect the fact that over the past twenty years an enormous amount of time and money has already been spent by both governmental and private bodies in coping with the problems of old age. Surely it is not too early to start using surveys to measure the effectiveness of all this activity.

DISCUSSION

matter as important as health, but it was agreed by Mr M. ABRAMS that too little work had been done upon the reliability of the memories of people in general and of old people in particular.

Miss K. M. SLACK (U.K.) raised the question of obtaining a satisfactory sample of old people from *the general population,* and it was agreed by Mr Moss that by using the voting register it was

possible, though neither easy nor cheap, to construct a satisfactory sample.

Dr A. L. VISCHER (Switzerland) mentioned his own survey in Basle, modelled upon Dr Sheldon's in Wolverhampton. From it he had found that 7 per cent. of his sample lived in institutions, homes, or hospitals. Of women over 75 years of age 23 per cent., but of men only 7 per cent., were in such institutions. Eighty per cent. of old people with glasses had bought them on a medical prescription from an ophthalmologist and only 12 per cent. from an optician. He gave these few instances to show the general value of such surveys, not only for obtaining information about old age but also for giving a picture of the conditions of old people in different countries.

On the question of planning and making surveys so that their results would be internationally comparable, Mr W. A. SANDERSON instanced the comparative research being conducted by the International Sociological Association on " social mobility " in some of the countries of Western Europe and in Australasia, and Dr J. DURAND (United Nations) confirmed that there would be a case for using the United Nations Organisation as an international clearing house for information.

Mr CLARK TIBBITTS suggested from the Chair that the International Gerontological Association should have within it a group of people interested in sociological research on old people who could take the lead in developing plans for comparative research on an international scale.

II. THE SHEFFIELD SURVEY

PEMBERTON, J., Sheffield. *The measurement of health in groups of elderly people living at home.*

THE measurement or assessment of the health of groups of elderly people living at home is a problem in epidemiology, using the word in its newer context to mean the study of the incidence of any disease or disability in a defined population.

Such a study will normally reveal the distribution of the disease in question by age and sex, and sometimes by other factors such as occupation, place of residence, and social class.

The opportunity to make such a study of elderly people occurred in Sheffield in 1948. A previous social survey reported by Greenlees and Adams in 1950 had led to the selection of a 1 : 30 sample of all those living in the city of pensionable age (women over 60 and men over 65 years) from the Food Office register. For our medical and dietary survey, all those in this sample who were living alone or with their husband or wife and who were willing to participate were selected. As two years had elapsed between the surveys, the youngest women were then 62 and the youngest men 67. Altogether, 476 elderly people were medically examined in their homes, 192

men and 284 women. The sample contained slightly fewer women and slightly fewer subjects from the higher income groups than

alone or in married couples.

o ways: firstly, n it and in its may be called Both methods were attempted.

The incidence of pathological conditions—The incidence of the different pathological conditions found varied very widely from, for example, 0·4 per cent. who suffered from scurvy up to 97·5 per cent. who had refractory errors requiring spectacles for their correction. The incidence of most of the important conditions was compared in different groups of the sample, broken down in the

of con- nt were go, loss of vibration sense, senile dementia, enlargement of the heart (judged orta, radiological

nces. Deafness whereas vertigo 1 oftener in the women—a fact also noted by Sheldon (1948). High blood-pressure was commoner in the women and severe clinical arteriosclerosis commoner in the men. As regards mental and emotional troubles it was found that approximately half the women and a quarter of the men suffered from various degrees of morbid anxiety or depression. Severe neurosis, although rare, was five times commoner in the women. Hernia was common in the men, though not in

Social class—The subjects were grouped into the Registrar General's five social classes (1938) on the basis of the breadwinner's previous main occupation.

The incidence of dental caries, deafness, and chronic bronchitis

symptoms. All mental symptoms and general weakness not attributable to any specific disorder were also excluded. In both

TABLE I

GENERAL ASSESSMENTS OF HEALTH OF 192 ELDERLY MEN AND 284 ELDERLY WOMEN LIVING AT HOME

	Bedridden.	Confined to House.	Limited Out-of-door Activity.	Unrestricted Mobility.
	Per cent.	Per cent.	Per cent.	Per cent.
Men . .	0 5	2·6	25 7	71·2
Women .	1·8	12·4	30·9	54·9

PHYSICIAN'S ASSESSMENT

	Unfit.	Moderately Fit.	Fit.
	Per cent.	Per cent.	Per cent.
Men . .	25·1	48·7	26·2
Women . .	28·5	48·5	23·0

SELF-ASSESSMENT

	Unfit.	Moderately Fit.	Fit.
	Per cent.	Per cent.	Per cent.
Men . .	6 3	32·3	61·4
Women . .	14·4	36·9	48 7

FREQUENCY OF MEDICAL ATTENTION

	Percentage receiving Medical Attention every Three Months or more often.
Men	44·8
Women .	47·9

cases a quantitative assessment of the disabling effect of these conditions was felt to be beyond the scope of the investigation.

The significance of the index as a measure of ill-health and

TABLE II

SCORING SYSTEM FOR DISABILITY AMONGST OLD PEOPLE

Group.	Sub-group.	Score.
1. Cardiovascular	Cardiovascular classification (New York Heart Association, 1939)—	
	1	0
	2	5
	3	12
	4	20
2. Joints, etc.	Paget's disease	1
	Osteo-arthritis and/or spondylitis	1
	Rheumatoid arthritis (except of feet)	1
	Gout	2
	Sciatica	2
	One or more of bursitis, fibrositis, neuritis, lumbago, backache, rheumatism	1
With any of the above	Limitation of outside movement	4
	Disability causing house-fastness	10
		17
3. Respiratory		3
		6
	Asthma	4
4. Feet	Each of hallux valgus, hammer toe, bunions, onychogryphosis, plantar warts, chilblains, arthritis, callosities, ingrown toe-nails, miscellaneous (four cases)	½
5. Urinary, etc.	Urinary incontinence	5
	Fæcal incontinence	5
	Cystitis	1
	Dysuria	1
Alternative to urinary incontinence	Frequency of micturition day and night	2
	Dribbling and overflow and/or stress incontinence	1
	Precipitate micturition	1
6. Hearing	Moderate deafness	1
	Severe deafness	4
	Complete deafness	6
	Continuous tinnitus	2
7. Nervous system	Hemiplegia or Monoplegia—	
	Which confines to house	18
	Which limits outdoor movement	10
	With residual weakness	4
	Parkinsonism	2
	Epilepsy, cataplexy	4
8. Vertigo	Frequent	2
	Continuous	5
9. Hernia	Hernia	2
10. Digestive	Indigestion	1
	Gall-bladder disease	2
	Duodenal or gastric ulcer	4
11. Hæmorrhoids	Hæmorrhoids with symptoms	3
12. Prolapse	Prolapsed uterus	3
13. Sight	Blindness	12
	Inability to read with spectacles	3

TABLE II—*continued*

SCORING SYSTEM FOR DISABILITY AMONGST OLD PEOPLE

Group.	Sub-group.	Score.
14. Anæmia	Hæmoglobin—	
	80 to 84 per cent.	1
	70 to 79 per cent.	2
	60 to 69 per cent.	3
	50 to 59 per cent.	5
	40 to 49 per cent.	7
	40 per cent.	8
	Pernicious anæmia	7
	Pernicious anæmia with subacute combined degeneration of cord	12
15. Varicose veins, etc.	Varicose veins with ulceration	3
	Thrombophlebitis	4
	Varicose dermatitis	1
16. Nutritional	Scurvy	5
	Ariboflavinosis	2
17. Effects of trauma	*e.g.*, Malunited fracture of wrist	2
	e.g., Erb's paralysis of arm	4
	e.g., Amputation of leg	8
18. Diabetes	Under control	6
	Ketone bodies in urine . . . add	3
	More than a trace of sugar in urine . add	3
19. Additional causes of disability	Trigeminal neuralgia (two cases)	3
	Post-herpetic pain (four cases)	3
	Effects of poliomyelitis with amputation of right arm (one case)	18
	Neurofibromatosis (one case)	1
	Congenital pes equino-varus (one case)	2
	Fistula in ano (one case)	3
	Cancer (two cases)	8
	Chronic alcoholism with early liver failure (one case)	4
	Charcot's joint (one case)	4
	Vesico-rectal fistula (one case)	5
	Generalised dermatitis (one case)	1
	Acne rosacea (two cases)	1

disability—Some check on the significance of the scoring system as a measure of ill-health and disability is afforded by comparing it with two of the other general assessments of health which have been already discussed, namely, the mobility of the subject and the physician's general assessment.

Table III shows the mean disability scores in relation to different degrees of mobility, and Table IV shows the distribution of scores in the three categories of fitness as assessed by the physician. In so far as the assessment of mobility and the physician's assessment of fitness can be regarded as independent of the scoring system, they indicate that the scoring system does give a numerical estimate of ill-health which has some validity.

Variation of disablement score with sex and age—Table V shows the distribution of the disablement scores by age and sex. At each age the women had a mean disability score five or six points higher than the men. There was a trend towards higher scores with increasing age in both sexes. The scatter of disablement scores by

TABLE III

DISABLEMENT SCORE AND MOBILITY

Activity.	Men.		Women.	
	Number.	Mean Score.	Number.	Mean Score.
Unrestricted . . .	136	13·4	155	12 4
Restricted . . .	48	23·8	82	24·0
House-fast or bedridden .	6	36·6	35	32·2

TABLE IV

DISABLEMENT SCORES IN RELATION TO PHYSICIAN'S ASSESSMENT (MEN AND WOMEN COMBINED)

Score.	Physician's Assessment.		
	Fit.	Moderately Fit.	Unfit.
0 to 3 . .	25	1	.
4 to 7 . .	31	10	. .
8 to 11 . .	36	32	.
12 to 15 . .	25	47	6
16 to 19 . . .	3	51	10
20 to 23 . .	1	34	17
24 to 27 . .	1	27	24
28 to 31 .		7	21
32 to 35 . . .		7	16
36 to 39 . . .	.		14
40 to 43 . . .			7
44 and over .			7
Mean score (men) .	8 2	16·4	26 6
Mean score (women) .	7·2	17·0	30 2

age was very wide. In spite of their trend to higher scores with advancing age, there were a considerable number of very fit men and women (*i.e.*, those with scores under 12) at advanced ages, including two old women over 80 with scores of less than 4. Conversely there were plenty of subjects with high scores in the lower age groups.

Variation of disablement score with social class—There was a trend showing an increase in the mean disablement score as the economic scale was descended (Table VI). The differences, however,

TABLE V

DISABLEMENT SCORES BY SEX AND AGE

	Age.										
	62.	64.	66.	68.	70.	72.	74.	76.	78.	80.	82+.
Mean score (men)	...	...	10·2	13·0	15·0	17·4	17·6	18·4	23·6	18·6	23·0
Mean score (women)	10·6	15·4	16·0	18·6	20·8	22·0	22·4	15·4	25·2	27·6	23 6

did not reach the conventional level of statistical significance. The mean disablement scores of those living in the better residential districts of Sheffield were, however, significantly lower than those

TABLE VI

DISABLEMENT SCORE BY SOCIAL CLASS

Social Class.	Men.		Women.	
	Number.	Average Score.	Number.	Average Score.
I and II .	36	14·2±1·5	42	17·8±1·5
III . .	111	17·0±0·9	167	18·2±0 9
IV and V .	42	17·6±1·4	59	19·2±1·5

living in the other parts of the city. Rather surprisingly the mean scores of those men who had retired did not differ significantly from those still working at similar ages.

This suggests that retirement usually occurs for other reasons than ill-health.

Chief causes of disability—Table VII shows the chief causes of

rheumatoid arthritis, and then respiratory disease, mainly chronic bronchitis and emphysema. It was also found that these three classes of disability were responsible for most of the cases of restricted mobility and in the same order of importance. Research directed

towards the prevention of these conditions might therefore be expected to have, if successful, the greatest effect in improving the

TABLE VII

PERCENTAGE SCORE ASCRIBED TO DIFFERENT GROUPS OF PHYSICAL DISABILITY FOR THE WHOLE SAMPLE

Group.	Percentage of Disability Score.	
	Men.	Women.
Cardiac	36·8	37·5
Joints, etc.	10·2	11·2
Respiratory	10·8	10·2
Feet	8·1	8·7
Urinary	7·5	6·9
Defective hearing	6·6	5·1
Nervous system	2·6	2·8
Vertigo	1·8	3·1
Hernia	4·7	2·2
Digestive	2·2	2·7
Piles	2·5	1·9
Prolapse	...	1·5
Defective eyesight	1·2	1·9
Anæmia	1·4	1·4
Varicose veins, etc.	0 8	0 8
Nutritional	0·5	0·4
Trauma	0 8	0 4
Diabetes	0 0	0·3
Additional	1·3	1 1
Total	99·8	100·1

health of the elderly. Painful feet, urinary disorders, vertigo, and defective hearing and eyesight also figured high by both assessments and would also repay intensive research aimed at their prevention.

SUMMARY

The health of a group of elderly men and women living on their own in Sheffield was assessed in two ways: firstly, by discovering the incidence of various pathological conditions in the group, and secondly, by using five different methods for assessing their general effective health. The latter consisted of:—

1. An assessment of mobility (bedridden, confined to house, restricted outdoor activity, unrestricted).
2. Physician's general assessment after full medical examination (unfit, moderately fit, fit).
3. Subject's own assessment into similar categories.
4. Frequency of medical attention.
5. A disablement scoring system.

[illegible]

From the general assessments of health, certain conclusions emerged. Firstly, elderly women age for age suffer more disabilities than elderly men. In both sexes the amount of disablement increases with age. There was some relationship, though not a very close one, between health and social class based on an occupational classification. The mean disablement scores were significantly higher in those living in poorer neighbourhoods compared with the better residential districts.

The classes of illness causing most disability were, in order, heart disease, arthritis and rheumatism, and chronic bronchitis. Painful feet, urinary disorders, vertigo, deafness, and defective eyesight also figured high in the assessments.

ACKNOWLEDGMENTS

[illegible] record my indebtedness in particular to Dr H. Droller, who carried [illegible] on, who was [illegible] pects of the [illegible] publish the full report shortly.

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DROLLER, H., Leeds. *Falls and accidents in a random sample of elderly people living at home.*

Introduction—*Most of the information on falls of the elderly derives* [illegible]

Report, 1951).

Information about the frequency of falls in an elderly population living in their homes was not available until Sheldon's investigation in Wolverhampton (1948). Sheldon noted the very high incidence of falls among the elderly (40 per cent.) and devoted an interesting chapter to a discussion of the mechanism of falls. However, the [illegible]

[illegible]

rest in bed, and the part played by environmental factors and/or physical disability. The subject of falls was discussed twice with each subject, first on the occasion of the preparatory visit of the social worker and again on the visit of the examining physician (H. D.).

Tendency to fall—The number of falls increases with age (Table I). They occurred twice as often in women as in men and happened to women earlier than to men.

TABLE I

AGE COMPOSITION AND LIABILITY TO FALLS (RANDOM SAMPLE)

	Men.			Women.			Whole Sample (excluding women below 65).		
Age.	No. at Risk.	No. liable to Falls.	Percentage of Age Group.	No. at Risk.	No. liable to Falls.	Percentage of Age Group	No. at Risk.	No. liable to Falls.	Percentage of Age Group
60 to 64 .	...	...	...	44	12	27·0	...	...	...
65 to 69 .	39	7	17·9	105	47	40·8	144	54	37·4
70 to 74 .	79	14	17·7	75	42	56·0	154	56	36·3
75 and over	*74*	*24*	*32·3*	*60*	*36*	*60·0*	*134*	*60*	*44·6*
Totals .	192	45	23·4	284	137	48·2	432	170	39·4

The causes of falls—Falls in the elderly can be caused by many [illegible] conditions or by both. The [illegible] is, [illegible] an

accurate description of what he means by giddiness or dizziness. The term may be used to convey any unpleasant sensation above the diaphragm.

One-half of the sample complained of a sensation of apparent movement which, I suppose, we mean when we talk about vertigo; but only one-third of those complaining of vertigo had experienced falls (Table II).

TABLE II

VERTIGO AND VERTIGO WITH LIABILITY TO FALLS (RANDOM SAMPLE)

	Men, all Ages.	Women, all Ages.	Total.
Number at risk	192	284	476
Vertigo	93	175	268
Per cent.	48·5	61·4	56·3
Vertigo, liable to falls	33	62	95
Per cent.	17·2	21·8	19·9

Other common pathological conditions are arthritis, old cerebro-vascular lesions, and weakness. There was a small group who suffered from sudden loss of muscle strength and difficulty in righting themselves. One person complained that her legs gave way for no ascertainable reason.

One would have thought that defective vision might account for many falls, but this was not so: only four women had falls attributable to impaired vision. Three had cataract and the fourth was almost completely blind as a result of glaucoma.

Deafness is closely associated with labyrinthine failure. We saw three men and fifteen women severely deaf who had had attacks of vertigo and had frequently fallen.

The environment—The "liability to fall" is always bound up [illegible]

houses with outside sanitation; toilets were frequently at a distance from the house and had to be reached across unlit and unpaved passages. Seventy-two per cent. of the subjects lived in houses built before 1920. These houses suffered from the common defects of such properties—narrow staircases, steps too high, lack of banisters, poor illumination, old-fashioned kitchen ranges and fireplaces with protruding corners. To these have to be added defective household implements and old and decrepit furniture. Floor coverings were unsuitable and gaps in the floor boards were not uncommon.

TABLE III

CONDITIONS CONTRIBUTING TO FALLS
(RANDOM SAMPLE)

	Men.	Women.
Clinical Conditions—		
Vertigo	28	56
Skeletal deformity and disease and arthritis of lower limbs	9	26
Old cerebrovascular lesions	3	7
Postural hypotension	5	10
Weakness	3	8
Sudden loss of muscle tone		4
Difficulty in righting	.	2
Legs giving way without ascertainable cause		1
Defective vision		4
Environmental Conditions—		
Tripping	5	23
Living on steep hills	...	4
Unsuitable stairs in/outside house	.	8
Loose rugs/defective floors	...	22

Conditions in Sheffield are made worse by the steep hills and the harsh winters. The seasonal incidence of falls was not investigated, but the case histories contain many references to icy roads, etc.

Sex distribution of falls—There was an excess of women who fell. This is accounted for by there being more old women than men. The margin which cannot be so accounted for can be explained by the greater domestic activity of women and the prevalence of arthritic changes in the weight-bearing joints.

The mode of living of elderly men and women differs; and this may have a bearing on the accident rate. Men try to reduce furniture to a minimum to do away with unnecessary dusting and

own paper-hanging and window-cleaning and thereby expose
table to reach the

subjects had sus-
be presumed to
curred and had
r relations were

o groups—those which happened in the street and those occurring at home (Table IV). In either case certain patterns emerged.

TABLE IV

PATTERN OF FALLS (RANDOM SAMPLE)

1. PLACE

	Men.		Women.		Total.	
Number at risk .	192		284		476	
		Per cent.		Per cent.		Per cent.
Street . .	7	3·6	16	5·6	23	4·8
Domestic .	3	1·6	41	14·4	44	9·2
Total .	10	5·2	57	20·0	67	14·0

2. SITUATION

Street—
- Injured by vehicle whilst crossing street . 6
- [illegible] . 5
- [illegible] . 8
- [illegible] by 2

Domestic—
- Falling down the stairs 17
- Falling from chairs, step-ladders, window-ledges . 10
- Slipping on loose carpets 8
- Tripping 4
- Unknown 5

Falls in the street were almost equally divided between the sexes; they were most frequent below the age of 70. After 70 the old person does not seem to venture so often across the streets.

An "accident" could be defined as any situation in which an individual fails to respond correctly to a hazardous situation. It is, however, very difficult to define an accident in detail when pathological conditions of a subject coincide with an environmental hazard. I have made no attempt to separate the two, but have [illegible]

enough to allow an elderly person to get on or off. This is particularly so during rush hours. The result is that the old person is thrown off or dragged along. Two subjects had falls on roads and were subsequently injured by vehicles after they had actually fallen down.

[illegible] falling down the stairs is the most con[illegible] is l[illegible]

the stair (loose carpets or boards) leading to tripping. Falling from chairs, step-ladders, and window-ledges is almost always the result of domestic activities—trying to put in new electric light bulbs, to clean windows, etc.

Fractures—Fifty people had sustained fractures after the age of 60, *i.e.*, 10·5 per cent. of the whole sample or 28·4 per cent. of those liable to falls (Table V).

TABLE V

FRACTURES (RANDOM SAMPLE)

Age at which Sustained.	Men.			Women.			Combined.		
	No. at Risk.	Frac-tures.	Per cent.	No. at Risk.	Frac-tures.	Per cent.	No. at Risk.	Frac-tures.	Per cent.
60 to 69 .	39	10	25·0	149	30	20·0	188	40	21·2
70 and over	153	4	2 6	135	6	4·4	288	10	3·4
All . .	192	14	7 3	284	36	12 6	476	50	10·5

SITE OF FRACTURES

	Men.	Per cent.	Women.	Per cent
Arms, elbow, wrist .	2	4	16	32
Ribs, scapula, clavicle	4	8	6	12
Leg, ankle	2	4	7	14
Femur .	1	2	2	4
Hand	1	2	2	4
Patella .			2	4
Foot . .	2	4	1	2
Pelvis .			1	2
Skull . . .	1	2	...	..

From the case histories it appears that the force required to break a bone may be quite trivial.

In a domestic survey such as this it is necessary to assume that one will meet the fittest survivors of such shock-producing conditions

who sustained
with hospital
om falls and
ome were the

fit, and unfit.

1. *Fit.*—Of good physique. Capable to undertake the ordinary activities of daily living; able to get about without restriction and without assistance.

2. *Moderately fit.*—Presence of one or more disabilities. Some restriction of activities of daily life; able to get about the house without help but requiring some assistance out of doors.

3. *Unfit.*—Presence of major disease or numerous minor disabilities. Incapable to lead an active life, room-fast or bed-fast.

(The mental state was not taken into consideration in this assessment. The eleven senile dementias seen were physically unfit with one exception, who was moderately fit.)

Of those liable to falls 41 per cent. were unfit, of the whole sample 27 per cent. (see Table VIA). Those not liable to falls showed only 18 per cent. unfit. It appears, therefore, that the subjects who fell were as a group less fit than the rest.

TABLE VIA

GENERAL HEALTH BY PHYSICIAN'S ASSESSMENT

	Fit.	*Moderately* Fit.	Unfit.
Whole sample . .	111	222	124
Per cent. .	24·3	48·6	27·1
Liable to falls . .	22	78	70
Per cent. .	13·0	46·0	41·0
The rest . . .	89	144	54
Per cent. .	31·0	50·2	18·0

If these figures are split up according to age groups we find that in men in all age groups those who fall are less fit than the others (Table VIB).

In the women the differences are similar except in the oldest group, where those liable to falls are as fit as the rest. The sample, however, [illegible]

complained of continuous vertigo was the same as in women who had fractures but did not complain of vertigo.

	Fractures since Age 50.
86 women with continuous vertigo .	19 (22 per cent.).
198 women without vertigo . .	37 (21 per cent.).

We had previously shown (Droller *et al.*, 1952) that excessive height of the systolic and diastolic blood-pressure is not related to vertigo or falls. On the other hand, we described a small group of

persons of the survey (Droller *et al.*, 1953) who showed a fall in blood-pressure on assuming the upright position after fifteen to twenty minutes rest (five men, ten women: 2·6 and 3·5 per cent. of the sample).

These people were much disabled by the hypotensive condition which made them lose balance immediately on rising from a chair or when stooping. One man and two women within this group suffered from aortic incompetence. They were the only cardiac conditions associated with falls in this survey.

TABLE VIB

Age Group.	Physician's Assessment of Fitness.	Whole Group.	Falls, Percentage of Age Group.	The Rest.
Men—		Per cent.	Per cent	Per cent.
65 to 69 (39) .	1	30·0	14·0	34·0
	2	77·0	28·0	51·0
	3	22·0	56·0	13·0
70 to 74 (79)	1	26 3	15·4	28·8
	2	48 5	46 2	49·2
	3	25·0	38 2	22 0
75 and over (74)	1	20·2	13·0	24·0
	2	40 6	34·7	43 5
	3	38·2	52·3	32·5
Women—				
60 to 64 (44)	1	52·0	25·0	60·0
	2	37·0	62·0	30·0
	3	11·0	13·0	10·0
65 to 69 (105) .	1	25·0	16·0	28·0
	2	51·0	38·0	56·0
	3	24·0	46·0	16·0
70 to 74 (75) .	1	4·0	13·0	6·0
	2	56·0	41·0	52·0
	3	40·0	46·0	22·0
75 and over (60)	1	16·0	15·0	15·0
	2	44·0	50·0	39·0
	3	40·0	35·0	46·0

Examination of the central nervous system showed no constant correlation between falls and incidence of hemiplegia, Parkinsonism, and absence of vibration sense. On the other hand, an extensor plantar response was four times more frequent in those men who fell than in the rest; and in women it was almost twice more frequent in those who fell than in the rest (Table VII). It is difficult to assess the role of minor cerebrovascular attacks in the causation of falls. Minor cerebral accidents are often associated with falls, vertigo, and temporary incontinence (Alvarez, 1946, 1948). A similar examination was made in a group of 468 consecutive long-stay annexe patients—as a control. Fourteen cases with a history of minor cerebrovascular attacks and with pyramidal signs and a tendency to falls were discovered.

TABLE VII

CORRELATION BETWEEN LIABILITY TO FALLS AND CENTRAL NERVOUS SYSTEM SIGNS (RANDOM SAMPLE)

	Men (192).		Women (284).		Whole Sample (476).	
	Liable to Fall, 45.	Others, 147.	Liable to Fall, 137.	Others, 147.	Liable to Fall, 182.	Others, 294.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Extensor plantar response .	24·4	6·1	11·6	7·5	14·8	6·8
Increased tendon jerks .	47·0	53 0	20 0	49 0	28·4	51·7
Absent vibration sense .	29·0	31·0	11·6	30·0	15·9	30·6
Old hemiplegia . .	4·5	5·4	0·7	2·7	1·6	4·08
Parkinsonism . . .	17·3	15 0	5·2	2·2	8·2	8·5

TABLE VIII

CORRELATION BETWEEN FALLS AND CENTRAL NERVOUS SYSTEM SIGNS (LONG-STAY ANNEXE SAMPLE)

	Men (163).		Women (305).		Whole Sample.	
	Liable to Fall, 17.	Others, 146.	Li able to Fall, 87.	Others, 218.	Liable to Fall, 104.	Others, 364.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Extensor plantar response .	41	17	40	7	40·3	9
Increased tendon jerks	47	53	44	40	35·3	40
Absent vibration sense .	12	27	27	17	22·2	21
Old hemiplegia . .	24	6	19	10	20·1	11
Parkinsonism . . .	12	4	7	8	8·6	10

TABLE IX

AGE COMPOSITION LIABILITY TO FALLS (LONG-STAY ANNEXE SAMPLE)

Age.	Men.			Women.			Whole Sample.		
	No. at Risk.	No. liable to Falls.	Percentage of Age Group.	No. at Risk.	No liable to Falls.	Percentage of Age Group.	No. at Risk.	No. liable to Falls.	Percentage of Age Group
60 to 64 .	..	...	..	31	3	9·8	31	3	9·8
65 to 69 .	28	2	7·1	57	8	14·0	85	10	11·7
70 to 74 .	48	2	4·1	41	21	51·2	89	23	25 8
75 and over	87	13	15·0	176	55	31·2	263	68	25·8
Totals .	163	17	10 4	305	87	28·5	468	104	22·2

Discussion—The literature on falls of the elderly is not extensive. The Registrar General's returns give information on the mortality from falls. Sheldon, in his Wolverhampton Survey (1948), has drawn attention to the great frequency of falls. Recently Seiler and Ramsay (1954) have discussed falls in the context of accidents in the home which required hospital treatment and stress the importance of environmental factors, especially bad housing and overcrowding. Scott (1954), discussing falls of the elderly, stresses the general diminution of all forms of sensation and adverse home conditions.

have been due to the hilly nature and the inclement winters of Sheffield.

Sheldon discusses the possible disturbances of labyrinthine function, although he felt that there might be several other mechanisms involved.

There seems little doubt that involutionary changes in the central

change of the central nervous system.

Whitfield (1954) was able to demonstrate on elderly miners (aged 53 to 66), whom he examined to elucidate accident-proneness, that their perceptual and cognitive tests were average or above average, but that they had poor motor control and co-ordination.

If we accept Whitfield's definition of an accident as "failure to make an adequate response to a hazardous situation," we can see

... to respond with his muscles

behave more circumspectly than the younger person, and thereby prevent accidents from happening.

Jokl (1954) has reported the observations which he carried out on a group of 1,704 elderly

He demonstrated on statisti

person has better control of

mechanism than the untrai

... constant muscular training throughout

other manifestations of ageing, can be prevented by gymnastic training, as Jokl appears to think, we do not know. The elderly miners of Whitfield's investigation appeared to have been physically very fit but still accident-prone and of poor motor co-ordination, ... co-ordination.

... eat opportunity for the ... y follow falls in old age by making sure that accidents do not happen to the elderly through control of their environment, by education, and perhaps by physical training continuing throughout life.

CONCLUSION

A random sample of elderly people living in their own homes in Sheffield was examined and their tendency to fall investigated. Thirty-five per cent. of the sample was subject to falls. The causes of falls were considered and a strong relation with environmental factors and domestic hazards became apparent. Sixty-seven of the sample had sustained fractures since the age of 60. The medical examination showed a greater number of medically unfit persons and greater evidence of pyramidal tract damage among those liable to fall.

I am grateful to Professor W. Hobson for permission to use the material of the Sheffield Survey.

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THIS paper is based ...
who were medically ...
clinical examination ...
urine were obtained ...

number attended hospital for dental, ophthalmological, and radiological examination and a number co-operated in a week's survey of their diet. This work involved the co-operation of over two hundred *general practitioners besides a considerable number of* specialists, dietitians, and social workers. This paper is particularly concerned with estimations made upon the blood of serum cholesterol, serum alkaline phosphatase, and hæmoglobin. Attempts have been made to lay down standards of normal variability in the elderly as information on this subject in the past has been very inadequate.

Serum cholesterol—It has been suggested that the serum cholesterol level is influenced by age, sex, diet, and metabolic state, but no general agreement on these points exists. Much of the evidence relating the serum cholesterol to the presence or absence of certain degenerative conditions such as arteriosclerosis is contradictory. For old people, only scanty data are available. Serum cholesterol estimations were carried out on 100 of the men and 143 of the women. Control estimations were carried out on thirty-six male and thirty-four female medical students. It was decided to exclude from the study those cases in which there was evidence of disordered [illegible]

[illegible] nd held [illegible] These [illegible] constant pressure.

[illegible] given [illegible] Smith [illegible] in the [illegible] is was confirmed for the serum cholesterol values in the present series. For this reason the logarithms of the values have been used for all calculations.

There was a significant difference in cholesterol values between sexes both in the elderly group and in the control (younger) group, the women having on the average a higher serum cholesterol level than men of the same age. In both sexes there was a significant difference between the serum cholesterol level in the elderly group and in the control (younger) group. Studies of the elderly group alone showed a lower cholesterol level in subjects over the age of 70 than in those under that age. The differences were not significant at the 5 per cent. level.

The subjects may be regarded as a representative group of people aged over 60 and the serum cholesterol results provide limits for " normal " values. If the normal range be regarded as the mean of the logarithmic values plus or minus twice its standard deviation

the results converted into mg. cholesterol per 100 ml. serum yield the following values for old people over 60:—

Men (98): Mean, 268; mean ± 2 standard deviation, 176 to 409.
Women (141): Mean, 310; mean ± 2 standard deviation, 200 to 481.

Diet and alcohol—In 64 per cent. of the cases studied, an individual dietary survey had been carried out. In the case of the males there was no significant correlation between the fat intake and the serum cholesterol level, whereas in the females the significance of the correlation was between the 2 and 3 per cent. levels of probability. Compounding the results for the two sexes gave a correlation coefficient which was between the 1 and 2 per cent. levels of probability.

In some of the men, information was available about the consumption of alcohol. The subjects have been divided into heavy drinkers (twelve men), lifelong teetotallers (fourteen men), and others (seventy-two men). To be eligible for classification as a heavy drinker, a history of drinking 5 to 6 pints or more of beer daily throughout most of life was required. A comparison was made of the mean serum cholesterol level in the twelve heavy drinkers (224 mg. per 100 ml.) with the level in the fourteen teetotallers (305 mg. per 100 ml.). The difference was significant between the 1 and 2 per cent. levels of probability.

Obesity—The relationship between the serum cholesterol level and the weight of the subject was studied by means of a scatter diagram. There appeared to be an undue proportion of persons with high serum cholesterol levels in the heavier subjects, but the *correlation coefficient between the two was not statistically* significant.

In the males there was no significant correlation between abdominal skin fold thickness and serum cholesterol level; in the females the correlation was significant between the 1 and 2 per cent. levels of probability. The correlation coefficients for the two sexes were compounded; the resulting coefficient was significant between the 0·1 and 0·5 per cent. probability levels.

Conditions possibly associated with atherosclerosis—It was impossible to establish any statistically significant relationship between the serum cholesterol level and the presence or absence of any of the following conditions: angina of effort, cerebral thrombosis, intermittent claudication, radiological calcification of the aorta, depressed crossings of the retinal blood-vessels, arcus [illegible] cataract.

[illegible] serum cholesterol level

Discussion—The results show that, in the elderly, women have a higher serum cholesterol than men of the same age. The finding of a higher level in the serum cholesterol in old people compared with that in young people is in general agreement with the

findings of Barker (1939), Kornerup (1950), and Keys *et al.* (1950) in the case of men, and with the findings of Mühlbock and Kaufmann (1938) and Gram and Leverton (1949) in the case of women. Sperry and Webb (1950) found that in twelve people (six men and six women) the serum cholesterol level had risen 15 to 30 per cent. after about fourteen years, and in te[illegible] same time interval had [illegible] ranges for these subjects [illegible] 38 to 57 years; women, 35 to 54 years. Page, Kirk, Lewis, Thompson, and Van Slyke (1935) studied the serum cholesterol level of sixty-seven men whose ages ranged from 21 to 101 and claimed that [illegible] regre[illegible] ages ([illegible] and showed a rise of the serum cholesterol with age which was significant on the 5 per cent. level. Barker (*op. cit.*) suggested and Keys *et al.* (*op. cit.*) found that with the onset of old age in men the serum cholesterol level began to fall; the present study does not contradict such a finding in both men and women. If the higher serum cholesterol levels were associated with lessened expectation of life [illegible]

[illegible] have shown that extreme variation in the fat intake produces changes in the serum cholesterol level. Groen *et al.* (1951) have shown that variations in the cholesterol content of the diet between 1·5 and 900 mg. per day can cause variations in the serum cholesterol level. Gardner and Gainsborough (1928) found a similar effect. The range of dietary fat intake in our survey was greater in women than in men, and this may account for the apparent correlation between serum cholesterol and fat intake found in [illegible] serum cholesterol level.

The findings of a relationship between alcohol intake and serum cholesterol is difficult to comment upon; Wilens (1947 *c*) expressed the opinion that the lower incidence of atherosclerosis observed in alcoholic subjects compared with non-alcoholics was not the result of alcoholism as such, but was attributable to associated differences in [illegible] race [illegible] the [illegible] ody weight and serum cholesterol level, but weight alone is not a true measure of obesity. As a better measurement, Keys (1949) studied the thickness of an abdominal skin fold; his results indicated that fatter men tended to have higher cholesterol values. These

differences when analysed by the only statistical methods open to us were not significant, but it is possible that a more refined technique would have demonstrated a significant difference. The analysis of our data suggests that there is a relationship. Such a finding is of considerable interest because a high incidence of atherosclerotic complications in the obese is a well-known experience of life insurance companies, and Wilens (1947, *a* and *b*) found that severe atherosclerosis is ten times commoner in fat people than in thin. In animal experiments, Firstbrook (1951) found that the greater [illegible] is strong evidence that in the human, too, atheromatous conditions occur more frequently in association with a high cholesterol level (see the reviews of Gubner and Ungerleider, 1949; Duff and McMillan, 1951; Katz, 1952). We were unable to demonstrate any relationship between the serum cholesterol and manifestations of atherosclerosis.

Serum alkaline phosphatase—The distribution of serum alkaline phosphatase values in seventy men and ninety women were plotted as a frequency distribution. There was a continuous series of values in men from 2 to 21 K.A. units per 100 ml. and in women from 3 to 27 units. After that there were no values in men until the level of 51 was rea[illegible] or over. [illegible] (see below[illegible] carcinoma of the bone can also cause a high concentration of serum alkaline phosphatase, but there was no evidence that these conditions were present.

"Normal" range of variability—In calculating the range of normality, it was decided to exclude only those cases definitely diagnosed as Paget's disease, *i.e.*, six men and two women. The rest of the results (sixty-four men and ninety women) were plotted as a frequency distribution and by calculation of Fisher's g_2 were shown to be lognormal. The range was calculated from the mean plus-minus twice the standard deviation, using the log values and reconverting into ordinary values. The results were as follows:—

Men: 2·7 to 25·5 K.A. units.
Women: 2·6 to 25·7 K.A. units.

These figures are considerably higher than those indicated in younger age groups, *e.g.*, Sunderman and Boerner (1949) give the range as 3·7 to 13·1 units.

High concentrations and Paget's disease—Seven men (10 per cent.) and four women (4·4 per cent.) had abnormally high readings. Six of the seven men and two of the four women were found by clinical or radiological methods or by both to have Paget's disease. No cause for high readings was found in the other three cases, and it is possible that they also were early cases of osteitis deformans.

Price (1950) refers to it a [illegible]

[illegible]

It has already been noted that there is a higher than expected incidence of various cardiovascular disorders in the subjects with Paget's disease. These included severe arteriosclerosis, low blood-pressure, congestive cardiac failure, aortic incompetence, auricular fibrillation, and enlarged heart. Paget (1877) described deafness as a characteristic feature of Paget's disease. In our series of seven men and two women there was one case of severe and three of moderate deafness. This incidence was not significantly different from that in the whole sample. This may be another example of how a symptom has been wrongly ascribed to a disease of the elderly simply because it is common in elderly people. [illegible] (1946) found that [illegible] per cent. of his cases of Paget's disease had defective hearing, but he did not investigate a control series. We found that 53 per cent. of all the men and 31 per cent. of all the women in our sample had defective hearing.

Only three of the nine subjects were aware that they had the condition, and these had been referred by their doctors to hospital for full investigation and treatment. It was surprising to find in several cases that so much deformity could be present without the subject being aware of anything wrong. Nocturnal pain in the shins aggravated by cold and worry but not by effort was present in six. Only two admitted to an increase in the size of the head. In all the subjects the onset was dated to the sixth or [illegible]

[illegible]

results fitting a normal curve, the normal range was expressed as the mean plus-minus twice the standard deviation. For males this was 10·8 to 17·9 g. per 100 ml. and for females 10·6 to 16·7 g. per 100 ml.

Using the large sample method (Fisher, 1941) for testing the significance of the difference between the two means, the standard error of the difference was calculated (0·16), and the difference (0·6) was found to be significant. Thus the females had a significantly lower hæmoglobin level than the males.

Over a certain age range which included approximately three-quarters of the subjects, there was a small but significant decrease in the hæmoglobin content of the blood with increasing age in both sexes.

Hæmoglobin and social class—There *was no significant difference* ... ther men or women in the

... ne compared with those living ... level of the forty-six men living alone was 13·9 g. per 100 ml. compared with a mean level of 14·5 g. per 100 ml. in the 131 men who were living with their wives. This difference was significant at the 5 per cent. level of probability ($t=2{\cdot}06$). There was no significant difference between the mean *hæmoglobin levels of the women who lived alone (13·9 g. per 100 ml.)* and those who were living with their husbands (13·8 g. per 100 ml.). Thus, living alone seemed to be ætiologically significant for the men but not for the women.

Hæmoglobin level and emphysema—The mean hæmoglobin level of the forty-five women showing radiological evidence of emphysema was found to be lower than the mean level in 137 women showing no ...

... old ... the blood.

Causes of anæmia in this group—Any person with a hæmoglobin level of 11·7 g. per 100 ml. (80 per cent. Haldane) or less was considered to have anæmia.

The incidence of anæmia was as follows:—

Men: Nine cases, *i.e.*, 5·1 per cent.
Women: Sixteen cases, *i.e.*, 6·5 per cent.

Men—Eight out of the nine cases had microcytic anæmia of the iron-deficiency type. The other had macrocytic anæmia associated with Paget's disease.

... ffered from macrocytic ...

... low iron intake; ... had a ... ntake.

On the other hand, there were several who were anæmic in spite of apparently adequate diets. There was no overall correlation between iron intake and hæmoglobin level. Apathy and a low income were the chief causes of the poor diets. The proportion of those with

incomes of thirty shillings or less per week was considerably higher than in the whole sample.

Another contributory factor was rheumatoid arthritis in six cases, particularly in women (five cases). Chronic hæmorrhage was not detected clinically in any case. Syphilis in one woman, scurvy in another, and chronic alcoholism in one man were the only other recognisable potential contributory conditions.

Discussion—Comparison of our results with those of previous workers is only feasible if the results are expressed in grams per 100 ml. because different methods have been used by other workers and varying standards have been set from time to time for the 100 per cent. level using the same technique.

The figures obtained in this survey of old people living in their own homes (14·4 g. per 100 ml. for men and 13·8 g. per 100 ml. for women) are in fairly close agreement with those found by Olbrich (1947) for people living in institutions (13·9 g. per 100 ml. for men and 13·2 g. per 100 ml. for women).

As far as we are aware, all observers agree that the mean level is higher in men than in women for every age group. The present study confirms this observation in so far as the elderly are concerned. [illegible]

45, but rises again after that; this fall and rise may be associated with the occurrence of menstruation and with its cessation respectively. It would appear, however, that over the age of 60 in women the cessation of menstruation no longer plays a part in causing a rise in hæmoglobin. The fall in hæmoglobin with age in both sexes may be partly due to a decreasing ability to absorb [illegible]

dietary deficiency.

Anæmia appears to be a condition which is very easily missed in old people as none of our cases was receiving treatment for it. A simple hæmoglobin estimation in all old people would be of considerable value for detecting a potentially remediable cause of ill-health.

Normal range of variability—This survey has shown that biochemical norms in the elderly may differ considerably from those found in younger age groups. There is a normal range of variability for these measurements in the elderly which should be taken into account when interpreting the results of diagnostic procedures.

The results for serum cholesterol, for serum alkaline phosphatase, and for hæmoglobin are summarised in the table on page 392.

TABLE

	Men.		Women.	
	Number.	"Normal" Range.	Number.	"Normal" Range.
Serum cholesterol (milligrams per 100 ml.)	98	176 to 409	141	200 to 481
Serum alkaline phosphatase (K.A. units per 100 ml.)	70	2 to 21	90	3 to 27
Hæmoglobin level (grams per 100 ml.)	177	10 8 to 17·9	247	10 6 to 16·7

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CHAPTER XI

NEUROPSYCHIATRY

BRAIN, Sir WALTER RUSSELL, Bt., London. *Cerebral lesions in old age.*

CEREBRAL lesions in old age constitute a very large subject with which I shall not have time to deal in detail. What I propose to do, therefore, is to make a general survey of the subject and then deal in more detail with a few of its special aspects.

Cerebral lesions in old age fall into three main categories: (1) First, there are those which are due to disease processes in the causation of which ageing plays an important part, for example, arteriosclerosis and cervical spondylosis. (2) There are other disorders in which, so far as we know, age plays no part and which may therefore occur at any age, for example, intracranial tumour. (3) It is useful to recognise a third group, conditions in which age *may be said to play a contributory part. Thus, avitaminosis may* occur at any age, but old age often plays a part in producing deficiency disorders owing to social circumstances, defective diet, and similar factors.

The distinction between cerebral lesions and lesions in other parts of the nervous system in old age is often an artificial one, [illegible]

[illegible]

nerves, such as pressure neuritis.

TABLE I

NEUROLOGICAL DISORDERS AFTER 60
(200 cases)

	Per cent.
Cerebral arteriosclerosis	24·5
Nervous complications of cervical spondylosis	14·0
Neurosyphilis	9·5
Epilepsy of late onset	7·0
Parkinsonism	6·5
Peripheral nerve lesions	6·5
Dementia	4·0
Motor neurone disease	3·5
Subarachnoid hæmorrhage	2·0
Trigeminal neuralgia	2·0
Arteriosclerotic myelopathy	2·0
Cerebellar degeneration	1·5
Myasthenia gravis	1·5
Brain tumour	1·5
Involuntary movements	1·0
Disseminated sclerosis	1·0
Miscellaneous	12·0

In Table I are shown the most commonly occurring lesions of the nervous system observed after the age of 60 in 200 patients of

been expected, cerebral arteriosclerosis heads the list, accounting for approximately a quarter of all cases and with no distinction between the sexes. Next in [illegible] tions of cervical spondylosis, [illegible] the commonest disorder of [illegible] will note [illegible] tumour of the spi[illegible] nearly 10 per cei[illegible] to the curative a[illegible] hing a stage at which syphilis will be seen much more commonly in the elderly than in younger persons. These are all patients in whose cases the anti-syphilitic treatment previously in vogue proved ineffective, or who were not diagnosed until the later stages of their disease. In this series males were affected four times more frequently than females. Most of the other categories call for no special comment. I shall be discussing intracranial aneurysm and sub-[illegible] It is perhaps rather surprising [illegible] is as low as 1·5 per cent. My [illegible] as Northfield, has been kind enough to review a series of 200 cases of verified intracranial tumours treated in the neurosurgical unit at the London Hospital and found that only twenty-six, or 13 per cent., occurred after the age of 60. These were made up as follows:—

Supratentorial gliomas	13, or 6·5 per cent.
Meningiomas . . .	5, or 2·5 per cent.
Metastatic carcinoma .	5, or 2·5 per cent.
Acoustic nerve tumour . .	3, or 1·5 per cent.

This series of cases does not include a patient suffering from subdural hæmatoma, but this is not an uncommon disorder in old age and may occur in the absence of any ascertainable history of head injury. The length of the history varies very greatly, and I have known an old lady of over 70 whose symptoms only became [illegible] injury [illegible] left [illegible] considered when an elderly person suffers from drowsiness with a fluctuating level of consciousness accompanied by headache, and the appropriate surgical investigations should be carried out. The main source of diagnostic error is to consider the condition arteriosclerotic in origin.

Cerebral arteriosclerosis—Cerebral arteriosclerosis is the major neurological problem of old age. Let me begin by pointing out [illegible]

which are important, not only in relation to our knowledge of the pathogenesis of the changes in the brain, but also in relation to treatment. In spite of a number of recent valuable studies on the physiology of the cerebral circulation, we have still a great deal to learn about this. It is clear that when any cerebral artery begins to develop pathological changes which narrow its lumen, some part at least of the brain which lies within its area of supply must suffer from a functionally defective circulation long before pathological changes appear which can be detected by the microscope. The earliest change, therefore, must be a functional one, and we have much to learn about that. How, for example, is it related to periods of activity and rest? What are the effects upon the metabolism of the grey matter and white matter respectively? What is the relative importance of oxygen lack, lack of sugar, amino-acids, vitamins, and so on? *Since we know that CO_2 acts as a vasodilator to the cerebral* vessels, and may be an important physiological factor in regulating their calibre, we may ask what is the effect of a raised CO_2 tension in a part of the brain when the vessels are becoming atheromatous

raising the level in the blood stream of substances necessary for its nutrition.

The next problem is to correlate the pathological changes in the brain with the symptomatology—in other words, to deduce from the clinical picture, aided sometimes by ancillary methods of investigation, the nature of the pathological changes present. I think it is probable that atheroma of the cerebral arteries may produce changes in the brain in at least three ways. First, the functional disorder of the circulation, to which I have alluded earlier, may eventually lead to microscopical changes without the occurrence of any focal area of infarction corresponding to the area of supply of any particular vessel. Secondly, such an area of infarction and softening may occur while the vessel so narrowed is still patent and not occluded by thrombus. Thirdly, there is actual cerebral arterial thrombosis. Precisely the same three changes occur in the myocardium where fibrosis may take place without actual infarction and infarction may occur without, or with, actual thrombosis.

Even when thrombosis of a large vessel has occurred, it makes a profound difference whether it is on the proximal side of the circle *of Willis or distal to it. McDonald and Potter (1951) made an* important experimental study of the cerebral circulation in the rabbit, in which animal the disposition of the cerebral arteries is similar to that found in man. Their observations show that the internal carotid artery, and the vertebral artery, share the blood

supply to their own half of the brain in such a way that there is normally no interchange of blood between them. The opposing streams derived from the carotid and vertebral arteries respectively meet in the posterior communicating artery at a "dead point," at which the pressure of the two is equal. Consequently they do not mix there. If, however, both internal carotid arteries are occluded, blood passes forward from the vertebral arteries. Conversely, if both vertebral arteries are occluded it passes backwards from the internal carotids. There is thus a functioning anteroposterior anastomosis in each posterior communicating artery. Similarly, occlusion of one internal carotid, or one vertebral artery, results in a flow of blood from the territory of the corresponding vessel on the opposite side. In these circumstances there is a side-to-side

some miles below their junction at Khartoum. Consequently, the blood from each vertebral is distributed ipsilaterally to the brain stem, cerebellum, posterior cerebral artery, and as far as the caudal part of the posterior communicating artery. Thus, if one internal carotid artery is occluded, a collateral circulation will normally be established from the opposite internal carotid artery and from the ipsilateral vertebral artery provided these vessels and those composing the remainder of the circle of Willis are sufficiently patent to allow this to take place. Now let us consider the effects of thrombosis of one internal carotid artery.

Thrombosis of the internal carotid artery—We owe to cerebral angiography the recognition of the syndrome of thrombosis of the internal carotid artery which was first described by Moniz, Lima, and de Lacerda (1937). Angiography by establishing the diagnosis during life has drawn attention to the clinical picture which is still

by thrombus. In other words, impairment of cerebral function may occur either intermittently or persistently as the result of defective blood supply caused by narrowing of an artery, for example, by atheroma, before actual thrombosis has occurred.

The fact that thrombosis of the internal carotid artery is sometimes discovered on angiography, without the patient having had any symptoms which could be referred to the lesion, illustrates the importance in relation to the production of symptoms of the state of the circulation in the circle of Willis and in the branches of the internal carotid artery. Here we enter territory which is still largely

unexplored. A number of factors may influence the cerebral circulation after occlusion of the internal carotid artery. These include the condition of the remaining cerebral arteries, including

Metabolic factors at the time may also influence the behaviour of the cerebral circulation.

Symptomatology—As stated above, thrombosis of the internal carotid artery can occur without producing any symptoms whatever. This, however, is exceptional. Probably there are prodromal symptoms which may extend over a period of a year or more. Characteristically these are transitory disturbances, presumably due to attacks of ischæmia occurring within the territory of supply of the affected internal carotid. Such symptoms, therefore, may be very varied and may include transitory attacks of amblyopia in the eye on the affected side, of mental confusion, of aphasia, and of weakness or dysæsthesiæ on the opposite side of the body. Focal

and sometimes crossed homonymous hemianopia, and, when the left hemisphere is involved, mental confusion and expressive and receptive aphasia. With the more severe lesions consciousness may be lost.

The degree of recovery of function is equally variable and no

of recovery even from hemiplegia may occur after a few weeks. When aphasia is present, some residual difficulty with speech is common, and there is often some permanent impairment of the higher mental functions, including control over the expression of emotion. At the worst, all the functions of that part of the

elderly and old people. It is a febrile illness characterised by severe and persistent headache with swelling, tenderness, and impaired pulsation in the arteries of the scalp. Though called temporal arteritis, it is, in fact, a generalised disease of arteries and may therefore involve the brain. In addition, the retinal arteries are often affected and this may lead to partial or complete blindness.

Dementia—Dementia is not as prominent among the cerebral disorders which bring the elderly or aged patient under the care of the neurologist. It is a matter of much greater concern to the psychiatrist. Nevertheless dementia constitutes an important diagnostic problem for the neurologist. I can leave to others the discussion of the differential diagnosis between focal cerebral lesions and the presenile dementias. I wish to draw attention to the danger of confusing dementia with an affective psychosis occurring in old age. This point has been well made by Roth and his collaborators. They point out that there is an increased tendency for an affective psychosis to occur in old age, and in men more than in women, for what may well be a genetical reason. Natural selection would tend to postpone the age of onset of an affective disorder which itself tended to shorten life, for example, by causing suicide, since those in whom the disorder did not occur until after the end of their period of fertility would be likely to leave more offspring than those in whom a potentially lethal disorder occurred during the reproductive

done for a patient suffering from endogenous depression.

Roth and Morrissey (1952) found in a study of 150 patients over the age of 60 admitted to a mental hospital in 1948 that affective psychosis was the largest clinical group, accounting for 54 per cent. of the cases, while senile psychosis accounted for only 24 per cent. They point out that the differential diagnosis between a depressive illness and a senile psychosis can be very difficult. "A depressed patient may be so retarded and apathetic, wasted, dirty, and neglected, that a long-established cerebral degeneration seems the most probable cause of his illness. Only a detailed and carefully taken history can provide the clue to the diagnosis, but it may prove impossible to obtain it from the patient." They draw attention to the diagnostic value of three or four electrical convulsions administered within fourteen days, which, in the depressive illness, will produce an unmistakable change in mood, spontaneity, and general vitality. Further investigations which may be of diagnostic value are electro-encephalography, since widespread electrical changes indicative of organic disease would be against an affective psychosis, and air studies of the ventricles, provided it is borne in mind that some enlargement of the ventricular system appears to be normal in later life. Great enlargement, however, would indicate cerebral atrophy, in which condition also there is often an excess of air over the cerebral cortex.

Deficiency disorders—In conclusion, let me say a word about the neurological aspects of deficiency disorders. Deficiency disorders [illegible]

[illegible] canal. There seems little doubt that arteriosclerosis may interfere with the supply of nutrients to the nervous system. Whether there is also defective utilisation of nerve cells we do not know. The B group of vitamins are the substances whose lack is most likely to affect the nervous system, but there are certainly other substances about which we know little or nothing at present. Wernicke's [illegible]

[illegible] of polyneuritis. Biochemical tests, if available, may be of value. Minor degrees of avitaminosis are probably much more common, and this is a subject which would well repay study.

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RUSSELL, W. RITCHIE, Oxford. *Diseases of the spinal cord and peripheral nerves in old people.*

The development of spastic paraplegia in the old patient is often attributed to the cerebral degeneration of senility, especially when there is obvious cerebral arteriosclerosis. This may sometimes be the correct explanation, but neurologists in this country have in recent years completely changed their views about these cases. They have become convinced that by far the most common cause of spastic weakness in the lower limbs in the older age groups is a degeneration of the cervical region of the spinal cord which develops in relation to cervical spondylosis.

[illegible]

some instances, cervical spondylosis may cause spinal cord symptoms in early life, especially where there has been previous injury.

In cervical spondylosis, degenerative changes occur in the intervertebral discs and hard ridges come to project backwards into the spinal canal. This condition has been recognised for a very long time, but only recently has its full importance become appreciated. Such projections would normally push the cord aside without injury as there is plenty of space for such a displacement, but other changes occur, and in particular adhesions form between the prolapsed discs, the posterior longitudinal ligaments, the meninges, the nerve roots, and the spinal cord itself.

Such a state of affairs renders the patient especially vulnerable to trauma such as may be caused by falls which involve striking or jolting the head, or even manipulation during an anæsthetic may lead to grave cord damage. Elderly men, for example, who insist on continuing sports such as riding when they already have severe cervical spondylosis, run a serious danger from even slight injury of a degree which would be trifling to the young and supple.

The spinal cord degeneration is, however, generally gradual and is often attributed to compression of the cord by the bony ridges. It should be emphasised that this compression is not comparable to [illegible] is not blo[illegible]nders thi[illegible] by a combination of pressure and traction interfere with circulation in the cord. Indeed, Allen observed the spinal cord to blanch while operating on one such case when he passively flexed the neck. No doubt the reduced elasticity of the tissues in old age contributes to the dangers of this state of affairs.

[illegible] weakness [illegible] sensory tracts. Involvement of cervical nerve roots often leads to some change in the arm reflexes, or to some muscle wasting or even fasciculation around the shoulder girdle muscles, which may lead to a wrong diagnosis being made of motor neurone disease. There may be pain in the neck or paræsthesiæ in the arms, but sensory symptoms are often absent. However, like all patients with spastic p[illegible] the thighs, a[illegible] of t[illegible]gy is actually to be found in the cervical spine.

The wearing of a light collar to prevent or limit neck flexion or extension is followed in most cases by a definite improvement in spinal cord conduction within two or three months. Rest in bed also leads to clinical improvement, unlike most other causes of spastic paraplegia. Such improvement with rest to the neck provides valuable confirmation of the diagnosis, and should worsening continue, the diagnosis requires careful revision. The long periods

spent by old people in a flexed posture in chairs no doubt contributes to the development of cord degeneration, and there is need for improved design of book rests and other devices to reduce the amount of neck flexion in those who are largely chair-ridden.

In some cases a myelogram seems desirable, especially when surgical treatment is considered. At myelographic examination the protruded discs are seen best with the patient lying prone and with a lateral exposure. The choice of cases for operation is difficult as the operation involves considerable dangers. In any case, the diagnosis is often lacking in certainty and the effect of neck fixation is often needed to provide additional evidence. Cervical spondylosis is also of importance in its relationship with certain types of brachial neuritis, but in this condition the middle-aged busy housewife is most affected and her occupation also plays a large part in causing this housewife's neuritis.

Disease of peripheral nerves occurs at all ages, and in old people pressure palsies are not uncommon. The most common is to the ulnar nerve at the elbow and the resulting atrophy of the hand muscles may lead to a wrong diagnosis of motor neurone disease. I have also observed in old people the condition known as acute shoulder-girdle neuritis to progress to atrophic paralysis of some shoulder muscles with subsequent recovery.

In addition, it should be mentioned that senile deterioration of circulation contributes to a variety of unpleasant paræsthesiæ for which I have no time to refer, and also to a liability to bed sores. Gross thrombotic lesions involving the vasa nervorum lead to sudden peripheral nerve lesions of a type which may occur, for example, in diabetes. Recovery is often surprisingly good even in the aged.

In conclusion, may I say a word about post-herpetic neuralgia and other intractable neuralgic-like pains ? I should like to make a special plea for repeated procaine infiltrations to areas which are hyperæsthetic in such cases. Such procedures are often successful for only a short time at first, but with repetition, say every second or third day, the pain thresholds become raised and wonderful relief results. In dealing with obscure pain, it is often important to ignore traditional anatomical knowledge and treat sensitive areas anatomically remote from the usually accepted segmental distribution of pain. There is still too much professional defeatism in dealing with pain. It is now more rational to insist that all pains can be relieved by appropriate measures.

COVELL, W. P., St Louis. *Noise-induced hearing loss and presbycusis.*

HEARING loss induced by noise and the progressive hearing loss associated with ageing belong to the nerve or perceptive type of deafness, sometimes called "intracochlear." Noise-induced hearing loss may be further defined as the impairment that results from exposure to either intermittent or continuous noise of sufficient

intensity and duration to produce permanent changes in the sense organ of the cochlea. It is intermediate between the temporary threshold shifts that result with exposure to noise, and from which recovery may take twenty-four hours or longer, and hearing loss due to acoustic trauma for which the exposure may be brief and of higher intensity. The spectrum of the noise, the intensity and duration of the exposure, and susceptibility of the individual are all variables that determine, in whole or in part, the degree of severity of the impairment.

During a lifetime there are many different factors that may produce deafness. Age is one of these, and the term " presbycusis " is used to designate this particular type of hearing loss for high tones. The extent to which other factors, including noise that produces a similar hearing loss, contribute to presbycusis has never been clearly defined. In view of the recent report (1) of a sub-committee of the American Standards Association on the " Relations of Hearing Loss to Noise Exposure," it becomes of interest to call to the attention of the gerontologists some results of this survey.

Presbycusis—There are a number of population surveys that deal primarily with the incidence of deafness. Three surveys are particularly valuable for the audiometric measurements used to determine the relationship between hearing loss and age. They are the survey of Bunch (2), the Chicago World's Fair survey (Steinberg, Montgomery, and Gardner) (3), and the San Diego County Fair survey (Webster, Himes, and Lichtenstein) (4). These surveys have considered presbycusis as an increase in the thresholds for pure tones with increase in age, and the curves for absolute hearing loss revealed a dispersion and skewness that increased with age and frequency. The distribution of presbycusis for the population as a whole varied, and there was a difference in the amount of hearing loss for the two sexes. Other similar surveys performed in the future may produce a more exact representation of incidence and degree of presbycusis in the population. It is nevertheless of interest to review the available statistics.

The curves for presbycusis as prepared by the sub-committee of the American Standards Association from the data of the three surveys are shown in Fig. 1. The reference line " 0 " represents the average hearing loss for the group between 20 to 29 years of age, with the exception that the value for the San Diego County Fair survey was a point half-way between the median for the men and the median for the women. The solid lines represent the hearing for men at frequencies of 500, 1,000, 2,000, 3,000, and 4,000 cycles per sec. and a range in ages from 25 to 65 years. The interrupted lines represent the data for women and include results from only two of the surveys since the Bunch survey contained no data on women. For the men the loss of hearing for higher frequencies appears to increase with each decade and at 65 years of age is approximately 37 decibels for 4,000 cycles per sec., 31 decibels for 3,000 cycles per sec., 24 decibels for 2,000 cycles per sec., and 10 decibels for 1,000 cycles per sec. For the women the average hearing

loss does not show the same degree of change with each decade, and at 55 years of age there is a tendency for the curves to show a gradual decline. At age 65 the hearing loss for 4,000 cycles per sec. is approximately 17 decibels, for 3,000 cycles per sec. 15 decibels, and

d problems on hearing, Exposures to steady noise are considered to be either continuous or intermittent.

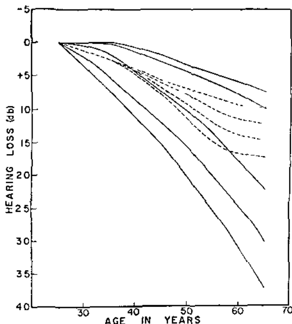


FIG. 1

Presbycusis curves for men (solid lines) and women (interrupted lines) as prepared from three surveys (2, 3, 4) by Sub-committee Z24-X-2 of the American Standards *Association (1).*

day and five days a week

A survey in one industrial plant yielded about two hundred audiograms that were considered suitable for a detailed study of the effects of exposure to a continuous noise. Although hundreds of audiograms were taken, only those of persons with no previous history of noise exposure or auditory malfunction were selected.

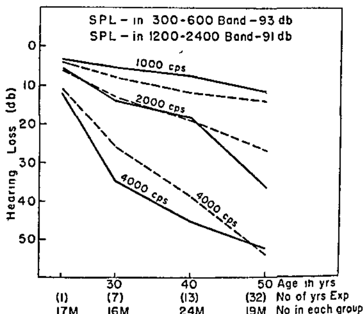


FIG. 2

Measured mean hearing losses (solid lines) and estimated mean hearing

respectively.

The ages of the employees varied from 22 to 64 years, and the periods of exposure ranged from two to forty-four years. No pre-exposure data were available for comparison. The sound pressure levels for different octave bands of noise spectra were analysed. They ranged from 86 to 93 decibels in the 300 to 600 cycles per sec. octave band, and 80 to 95 decibels in the 1,200 to 2,400 cycles per sec. octave band. Hearing losses for frequencies of 1,000, 2,000, and 4,000 cycles per sec. were measured unless the exposure time was less than three years. Estimates for trend curves were prepared by successive

sorting of cards on which age, length of exposure time, analysis of noise, and right and left ear audiograms were recorded. In order

values for estimated and measured hearing losses.

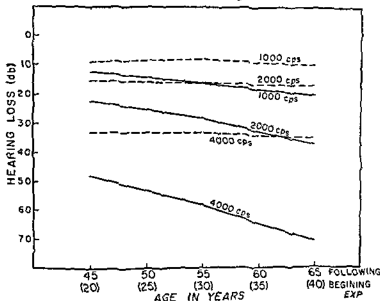


FIG. 3

There was a total of eleven groups in this survey separated on the basis of length of exposure to six different noise spectra. Four of the groups represented a total of seventy-six men for which the mean age of each was 23, 30, 40, and 47 years respectively and the mean durations of exposure one, seven, thirteen, and thirty-two years respectively. ... each duration of exposu ... 7·6, and 11·7 decibels; ... 18·5, and 36·9 decibels; ... 34·9, 45·6, and 52·5 decibels respectively. The sound pressure level of the 300 to 600 cycles per sec. octave band was 93 decibels, and in the 1,200 to

2,400 cycles per sec. octave band was 91 decibels. The results of the four groups exposed to this particular noise are shown graphically in Fig. 2. The solid lines represent the measured hearing losses for each of three frequencies, while the interrupted lines represent the estimated hearing losses for the same exposures. The measured and estimated hearing losses are gross hearing losses, since each includes the presbycusis value. For the estimated hearing [illegible]

were usually about fifteen minutes. This is probably insufficient time to overcome temporary effects of noise.

The effects of a flat spectrum noise of 90 decibels for a period of twenty-five years on a hypothetical group are shown in Fig. 3 for frequencies of 1,000, 2,000, and 4,000 cycles per sec. The ages at the beginning of the continuous exposure to the noise or twenty-five years previously are shown below the ages for which audiometric measurements were determined. The data represented were computed by the method of trend curves as previously explained and, of course, are hypothetical. The solid lines represent the total hearing losses for each of the three frequencies, while the interrupted lines represent the losses after correction by the presbycusis values. It would appear that the effects of continuous noise of such an intensity and spectrum and for duration of twenty-five years are independent of age. The middle and older age groups showed no [illegible]

to which intermittent noise and temporary threshold shifts may influence presbycusis values is, as yet, not satisfactorily determined. The amount of dispersion in any plotted data on audiometric measurements for presbycusis suggests that aside from individual variations in response to ageing other factors may contribute to the hearing loss. It may well be that our present concept of the degree of presbycusis with each age group will soon be revised with the [illegible]

that approximately 5·6 per cent. of the average loss in the 50 to 60 year group is due to age and a somewhat higher figure for the age groups 60 to 70 and over. Until such a time as presbycusis can be evaluated from the standpoint of the laboratory worker dealing with the pathological and electrophysiological aspects, the problem remains incompletely solved.

A variety of factors (6) not necessarily associated with ageing have been thought at one time or another to be the cause of presbycusis. Noise and acoustic trauma are apparently additive (1),

as may also be vascular changes (7, 8) and other known causes of deafness. The hearing of men and women is presumably affected in a similar amount by most additional factors. It would then appear that presbycusis is the result of a degenerative change in the cochlea, the effects of which become more pronounced with each decade and for which there is a considerable difference between the values for men and those for women.

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ORMA, E., Finland. *Vertigo and dizziness in old people.*

It is well known that dizziness is a common complaint in the old. In England, Droller and Pemberton have investigated its occurrence and have found that 47 per cent. of men over 67 years of age and 61 per cent. of women over 62 suffer from dizziness. In spite of its common occurrence this symptom has received very little consideration.

The material presented has been collected through advertising in the newspapers. In the advertisement people over 64 years of age suffering from dizziness were asked to telephone to our out-patient department. Time was reserved for the first 150 that reported.

Thirty-six patients did not attend for interview. Two were excluded as they would not have been able to attend for examination

Because many had to wait a long time for the examination—more than two months—some patients dropped out. These were probably those with the mildest symptoms and partly those with more severe symptoms, particularly those in which the dizziness had begun recently.

The patients were first subjected to a complete physical examination. A neurological, otorhinolaryngological (Koskenoja) and ophthalmological (Koskenoja and Koskinen) examination was

likewise performed on each patient. In many cases the histories could be verified from the case histories at the hospitals and various out-patient departments.

This paper must be regarded only as a resumé of our investigation, as certain control investigations are not yet finished.

By vertigo is meant disturbance in equilibrium in which there is a turning sensation and, on the other hand, by dizziness other disturbances in equilibrium in which there is no turning sensation. The word dizziness will likewise be used as a general term for all equilibrium disorders.

The material has been grouped according to the type of dizziness (Table I).

TABLE I

THE GROUPING OF THE MATERIAL
(112 patients)

Group 1. Attacks in which dizziness is only a subsidiary symptom	5 patients
Group 2. Continuous dizziness	3 patients
Group 3. Repeated attacks of dizziness	8 patients
Group 4. Postural dizziness	96 patients

Group 1 consists of patients in whom dizziness was only a slight symptom in addition to other dominating symptoms.

Group 2, those in which dizziness was continuous, independent of movements or postures.

Group 3, those in which repeated and severe attacks of dizziness appeared.

Group 4, persons in whom dizziness appears chiefly only in movements or definite positions. This postural dizziness group, which includes ninety-six patients out of the whole material of 112, is thus overwhelmingly the largest group.

The patients of this group felt dizzy mainly in connection with movements or in definite postures.

TABLE II

MOVEMENTS IN WHICH POSTURAL DIZZINESS APPEARED MOST OFTEN

All sudden movements	58 patients
Walking	54 patients
Rising from bed or sitting position	44 patients
Looking up	12 patients
Bending forward	12 patients
Sudden head movements	10 patients
Looking down	9 patients
Lying down	7 patients

As can be observed from Table II, in the majority of cases dizziness appeared in all sudden movements, but in thirty-eight

patients only in association with some definite movements. The most important provocative movements were walking and getting up.

The duration of dizziness (Table III) was generally very brief, [illegible]

TABLE III

DURATION OF DIZZINESS

Momentary or some seconds	67 patients
About one minute	22 patients
More than one minute	7 patients

The quality of this dizziness (Table IV) was pure dizziness in two-thirds. In one-third there was vertigo, which in most appeared alongside the dizziness. Often the vertigo occurred in quite definite positions. It is difficult for the patients to describe the type of dizziness, so their verbal descriptions have been used.

TABLE IV

QUALITY OF DIZZINESS

Dizziness pure		65 patients
"Momentary unsteadiness"	47 patients	
"Black-out"	22 patients	
"Loss of balance"	21 patients	
"Spots before the eyes"	16 patients	
"Feeling of falling"	16 patients	
"Confusion or heaviness in the head"	7 patients	
"Faintness"	6 patients	
Both dizziness and vertigo		27 patients
Vertigo pure		4 patients

With the majority postural dizziness began gradually (Table V).

TABLE V

BEGINNING OF DIZZINESS

Gradually		74 patients
From apoplexy		4 patients
From dizziness attack proper		17 patients
Cerebral vascular accident	12 patients	
Post-infectious dizziness attack	2 patients	
Labyrinthine vascular accident	1 patient	
Dizziness attack caused by streptomycin	1 patient	
Ætiology of the attack unknown	1 patient	

Many of these patients had definite symptoms of cerebral arteriosclerosis. Twenty gave a history of a *cerebrovascular accident*. In addition, in eighteen symptoms of local or diffuse cerebral lesions and in thirteen slight, mainly psychic symptoms of cerebral

arteriosclerosis were found on neurological examination. It is quite obvious that the cause of this geriatric dizziness is cerebral, apparently cerebral arteriosclerosis. This view is strongly supported by the observation of v. Fieandt and Saxén. They have made a clinical-pathological study of presbycusis. Among other things, they have stated that the age changes in the labyrinth are small and can therefore hardly cause anomalous vestibular reflexes.

DUNBAR, FLANDERS, New York. *The long-lived: ageing and illness.*

"All diseases may be by sure means prevented or cured, not excepting even that of age, and our lives lengthened at pleasure even beyond the antediluvian standard."—BENJAMIN FRANKLIN, 1780.

THE increasing population percentage beyond the now accepted retirement age is placing a burden on the younger generation. It has been observed that people who survived the dangerous age of 60 to 70 (or perhaps 50 to 80) without illness rarely succumb to geriatric diseases. This and other observations suggested the idea that a study of those who have succeeded in living to an advanced age should throw light on the characteristics that make for health at earlier ages. It seemed desirable, therefore, to make a study of nonagenarians and centenarians.

Method of Investigation

The question was how to find a good sample. Some twenty years ago when statistics were being published to the effect that one out of every two citizens of the United States spent at least two weeks or more in bed every year, the question was raised as to the possibility of studying the considerable percentage of the population who did not spend two weeks in bed every year, nor even in twenty years. Foundations said this was too expensive. Apparently it cost more to study well people than to study sick people. In thinking about how to find healthy people, it occurred to the author that magazines with a wide distribution might arouse interest in people who rarely consulted physicians. A note was published in several magazines, which added together made a 50 million distribution: "If you are a centenarian, or know a centenarian, send in your name and address and you will receive a free subscription to this magazine." The response to this small note was far beyond what might have been expected, and the cost was nothing because the publishers always have a few extra copies, and there were not enough people who could meet the requirement to make any considerable drain on their resources.

The questionnaire was sent to the names compiled in this way. The questionnaire was not very different from a usual medical history except that instead of saying, "Did you have measles, chicken-pox, smallpox, etc," it said merely, "How many days in

a lifetime did you spend in bed and why ?" and instead of saying, "What's your job now ?" and "Are you working ?" it said in effect, "Are you doing now what you always wanted to do, and if so, how did you get there ?"

Responses were obtained from 14½ per cent. of white centenarians in the United States (a much better sample than the Gallup poll) as reported in the 1950 census. Responses were obtained also from coloured and foreign centenarians, which differed very slightly, if at all, from those of the white centenarians in the United States; but because it was difficult to validate their birth certificates, they were not included in the statistical part of the study.

Questionnaires were sent out to all centenarians who sent in their names and addresses, and nearly all of them filled out and returned these questionnaires. Questionnaires were filled out and sent in by centenarians from every state in the Union. About 25 per cent. of those who sent in questionnaires were selected for interview. The interview served to confirm and amplify the facts set down in the questionnaires. On the basis of this material, the following points are selected as being characteristic of centenarians, or, as one might say, of people who had remained healthy for a long time.

General Observations

1. **Geographical distribution**—Contrary to the general impression, states like California and Florida, thought of as Meccas for the ageing, reported fewer centenarians per 100,000 population than [illegible]

better on a low *per capita* income than in New York, California, or Florida.

2. **Sex distribution**—In the general population of the United States there are more males than females between the ages of 40 and 55. Between the ages of 55 and 70, males still predominate, although females have a much longer life expectancy. But the ratio for life expectancy approaches unity after the age of 70. For example, white males 80 years of age had a life expectancy of 5·45 years and white females a life expectancy of 5·83 years. The "World Almanac" (1951) gives the life expectancy at 85 for the white population as 3·6 years for males and 3·7 years for females, and thereafter life expectancy seems to be the same for both sexes. In the series that constitutes the material for this paper, the ratio of sex distribution was one to one.

Perhaps one reason why the ratio of males to females approaches

attitude towards age as "one of several self-destructive trends in our society." It is his belief that two-thirds of the old persons in the United States feel unwanted. He adds that current social attitudes could lead them to no other conclusion. To quote from Gumpert (1951):—

> "The life span of old people is clouded by prejudices and conventional assumptions which are harder to overcome, since they have been accepted by the old people themselves throughout their life span. Old age has been misinterpreted for centuries by educational, economic, and social dogmas, and it is not easy, even within ourselves, to break down the misconceptions of such long tradition. We are convinced that old people are rigid, that their intellect is narrowed, that they become egotistic and isolated, that new ideas and new devices are adopted with difficulty and rarely created, that they are stubborn and stingy and generally emotionally unstable."

It is commonly believed that the aged are a burden, financial and social, which must be carried until they are considerate enough to die. But it is less commonly realised that the younger generation drill their prejudices against old age into their elders' backs, until their elders are convinced too. In this way lack of knowledge becomes truth until science proves the contrary. The relation of psychic discomfort to the incidence of chronic disease is not established, but the mental attitude of old people suffering from chronic disease is often found to be the attitude that Gumpert has described.

understanding of the hygiene of living remains to be determined, but it is certain that the engineer who loves his wife, his family, and his job maintains his youthful reaction time longer than the engineer who is disturbed. Present inadequate knowledge of the techniques by which to preserve homeostasis should be complemented by intelligent application of empirical or even statistical data.

Although these people like centres of activity, they rarely work up in organisations. They prefer a modest business of their own, from which they cannot be forced to retire. They are slightly above the average income level for this country and for their own communities. Few are very rich or very poor, and they all keep working.

Individual Personality Profiles

Centenarians as contrasted with sufferers from "diseases of old age" appear to be a different kind of human being. The

difference between the healthy and unhealthy in any culture is

questionnaire containing the question, " About how many days of your life have you spent in bed ? Give reasons," having crossed out the " about " and written, " exactly forty-five days—reason, nine children."

I. Basylewicz (1940) made a detailed study of seventy-two

called attention to the following traits in centenarians: (1) They sleep well; (2) they have no (or only very slight) emotional disturbances; (3) their character is syntonic with good emotional contact; and (4) there exists in them a healthy, well-preserved personality with an absence of character changes.

Nearly all students of the ageing process and of the aged call attention to the fact that we have tended to focus attention on the diseases encountered in the dangerous age 50 to 70. Anyone who has survived this period without serious body damage is very unlikely

will lose one-half of their teeth before the age of 40, and 40 to 50 per cent. of them will lose all their teeth before the age of 50. Furthermore, very few centenarians have suffered from any type of chronic illness.

Perhaps because there are so few centenarians per 100,000 population, the ones that do not fit this pattern get particular attention. They are likely to become " problem children," but on the basis of this study it appears that this happens to only one out of ten. The other nine, who remain healthy and happy and creative past the century mark, do not get into the literature because they make no trouble. They are assets instead of liabilities. Incidentally, it is extremely rare for a centenarian to die in a mental hospital. The kind that goes to a mental hospital does not become a

jump to another, but keep active." He enjoys the society of different age groups in addition to the stimuli of creative thought and doing. Or again, the banker of 100 years who " is hard on his shoes." His

favourite expression is that "a man on his feet is worth thirty on their seats." His personal fortune is estimated at several millions. In terms of the general population, the seats of both bankers and millionaires are more susceptible to regressive tendencies than their feet. But regressive tendencies may set in even at the age of 113. For example, a lady of this age had been urged by her progeny to stop working on her birthday. She complied, and after she gave up doing her own housework she caught the "first cold" she remembers having had in her entire life. She said "I just saved myself in time from dying by going back to doing my housework."

The accident record of a centenarian is about the same as that [illegible]

[illegible] in life as a deck hand. "I've led a charmed life. I've been shot at three times, nearly drowned three times, and run over by a car seven times, but I've lived to collect my insurance and I'm good for a long time yet." In other words, mishaps when they do occur appear not to get them down. Freedom from illness and injury is accepted so casually by the centenarian that he appears to be unaware of [illegible] Each, [illegible] gives a [illegible]

The personality profile of the centenarian is a very consistent one, more consistent than the personality profile for the accident-prone, or those subject to cardiovascular disease. On one point they differ widely. [illegible] smoking, some to [illegible] of 107 ascribed h[illegible] breakfast; and an[illegible] said, "If you wa[illegible] potential centenari[illegible] live to be 100." [illegible] to a contradictory [illegible] centenarians are individualists and show little need to dominate. [illegible]

lack of uniformity, show a group conformity.

Their social relationships are good. They have many friends and an excellent sense of humour. They seem to have been and are considered good companions. Unlike ageing persons who are not potential centenarians, their conversation is not focused on the "good old days." They talk about the next president and inventions to be expected twenty years from now as if they were going to be alive to enjoy them.

Unless the centenarian has suddenly become ill as a result of some threat to his continuing activity, he appears to be living just as he

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expressed annoyance about being questioned as to her age. She said, "I don't know why they do it because it's perfectly natural to be 109."

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house the interviewer commented on the deliciousness of the apples. Whereupon she said, "If you wait a minute I'll run out and pick some for you." He said, "No, let me do it when I get ready to go. I would rather talk with you." She said, "All right, I'll send the boy." The boy who brought in the apples turned out to be her nephew, aged 99.

Ageing persons prone to, or suffering from, chronic illness are likely to try to have the household and the family, no matter how

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change. It's part of my character." The centenarian will say, "Things used to be that way, but the changes since I was young make life more interesting." The former believes that he will be to-morrow the same person he is to-day or was twenty years ago. But the centenarian, as time goes on, has a happy expectancy of change combined with a feeling that he can cope with whatever

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set. Perhaps this is because consciously they are in better control of their psychosomatic machinery than is the average human being.

SUMMARY AND CONCLUSIONS

Some of the

lapping in the

new series.

2. A personality profile of centenarians has been outlined and contrasted with personality profiles of persons suffering from the

these illnesses
even though
s 50 to 70.

They are illnesses to which the centenarian rarely succumbs. The centenarian appears to be a different type of person from the person who becomes a chronic invalid after 65, because he has managed to avoid a large majority of hazards which produce illness. It has been said that "psychoanalysis may be defined as *une folie à deux* where only one gets well." Society may be defined as *une folie à plusieurs* in which only one out of thousands is enabled to become a centenarian.

3. The fact should be emphasised that only 80 to 90 per cent. conformity with the profile outlined for any illness syndrome is to be expected. This is true also for the syndrome of longevity.

4. The data here presented would suggest that gerontologists analyse carefully the results of the "tapering off" or progressive retirement procedures *versus* the facilitation of enjoyed productivity. Probably the only way to determine which is more likely to favour longevity is to observe. Centenarians seem to have chosen the latter.

5. Increased production is recommended by economists and politicians as a means of improving the standard of living. The

of 65 wish to work and stay healthy because they work. Why not use their services to increase production and decrease the public burden created by the illnesses they develop when frustrated?

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BARUK, H., Paris. *Some fundamental principles of neuropsychiatry of the elderly.*

In geriatrics some of the most difficult problems are those found when dealing with psychiatric cases. In fact, the situation of a large number of old people who are affected by diseases of the nervous system, and especially those with depressive mental states, is a critical one in all countries. There is a steadily increasing lack of

...tients suffering ...ospitals do not ... the psychiatric ..., prefer not to take them in and try to avoid their admission. We feel that we should point out here that there is a certain section of opinion which is not in sympathy with gerontology and the medical care of the elderly. In fact this school ...

and that it is not possible to envisage in the aged a complete recuperation and a return to the productivity and social activity of youth.

As a result of the regressive moral attitude sometimes seen in some of the medical clinics at the present time, it is true that many old persons affected by nervous disease or mental illness find themselves at a great disadvantage and their place has not yet been well defined. This attitude with regard to old people which we have just pointed out, is not only unfair and even rather scandalous from the human and moral point of view, but it is also not a scientific attitude. It is, indeed, a great mistake to believe that all aged persons affected by mental diseases are incurable and that their illness cannot be treated. There are cases of temporary mental disturbance in old people which can disappear with the correct treatment; there are also, even in the serious cases of senile dementia, a number of cases where, in spite of the persistence of the dementia, a large percentage of the symptoms can be ameliorated—particularly certain forms of agitation, confusion, onirism, which with proper care and with a suitable environment can be cured. Consequently a well-organised department can achieve definite improvements, and even when a complete cure cannot be achieved some relief or improvement can be maintained. This is, after all, the object of medicine; for whatever one says, medicine is not only the social recuperation of the individual, medicine is above all a moral ethical science which tries to cure, and when it cannot cure, tries to alleviate suffering and to prolong the human life in the most favourable conditions for the longest possible time. As a result everything appears to favour the development of neuropsychiatry for the aged person, although this has yet to be organised.

It is these fundamental principles of organisation we should like to discuss in this paper.

In order to understand the principles of the organisation of neuropsychiatry for the aged, we must first set out the two different therapeutic methods which exist in medicine and more particularly in psychiatry.

The first method is the so-called "symptomatic" method. It consists in the use of certain measures to allay, and allay in ...

quickest possible way, the symptoms or to make these symptoms disappear. It is a palliative measure which does not seek out the cause of the depression but only relieves the urgent symptoms.

The second method can be called " ætiological medicine." This does not treat only the symptoms but looks for the causes of symptoms and treats the cause once it is known. This is the most efficient medicine.

After the striking development of ætiological medicine in the last century we return now to the utilisation of purely symptomatic medicine, which is due to the new development of the great discoveries of pharmaceutical products which gives more power to the doctors to treat. The abundance of drugs causes a departure to some extent retrogressive from the spiritual trends of medicine. It tends, in fact, to force the doctor to use all manner of drugs at his disposal and neglect the important investigations which can be demonstrated, especially in cases of geriatric medicine, on numerous occasions.

For instance, let us take a case which is very common in agitated old people. In general these patients present a complex of symptoms which mainly occur at night when the patient gets up and wants to escape. The patient imagines that he sees people around him and gives way to reactions and disguises his environment. Frequently to this nocturnal restlessness are attached ideas of persecution, with the result of senile delirium. These patients develop ideas of prejudice and aggressiveness against their environments, they distrust generally, refuse examination and external help. These symptoms make the illness appear very serious and indeed exhausting to the relatives, and the physician tries to give urgent relief. Quick aid which the physician thinks is adequate is merely symptomatic medicine when given in the form of soporific sedatives and hypnotics, of which a great abundance are at present offered on the market of modern pharmacology.

It is possible, therefore, to attack the illness very quickly with various barbiturates, more or less complicated sedatives, and alkaloids like morphine, sedol, etc., but it is often observed that these drugs, far from curing the disease, increase the patient's restlessness and irritability. In fact to the disease is added the toxic factor of the drug; and when this toxic factor is given to a patient whose excretory capacities are impaired, whose hepato-renal balance is disturbed and whose circulatory system is deficient, the confusional state increases considerably, the element of anxiety increases, the patient is more agitated day after day, and if this treatment is continued it is possible to observe that the resistance of the patient disappears and complications arise which can accelerate the patient's death.

This therapy, therefore, is not only inefficient but also dangerous. In such cases it is necessary not only to alleviate the patient but to investigate with meticulous care. It is very common, especially in old people with agitation, that one finds hepato-renal disturbances,

rise of the NPN which is of great importance. The presence of circulatory insufficiency is very frequent, heart arrhythmia, high blood-pressure, and possible early signs of cardiac insufficiency. Instead of treating patients with toxic sedatives, treat their circulatory changes with great care by using drugs which will permit a better renal circulation, with proper diet and [illegible]

[illegible]

In fact the problem of prognosis is one of the most difficult in old people. In such cases it is very important to be cautious to predict chronicity. We know by experience that the tendency is always to simplify, and that the history of psychiatry shows in every epoch there are one or two dominant diseases which occur universally and [illegible]

[illegible]

senile dementia. This pessimistic tendency, against which Esquirol has already protested, is again very common in psychiatry and is the reason for grave prejudices in treatment of patients. In such cases we have frequently observed patients who have apparently symptoms of senile dementia but who are actually suffering less from agitation than [illegible]

[illegible]

ated, apathy followed with failure of memory and disorientation in time and space, which caused several physicians to diagnose senile dementia with a most pessimistic prognosis. Subsequently the patient was sent to the country and then his hepato-renal and circulatory insufficiencies were treated. In six months his mental functions were re-established with complete cure in a patient of 70 years of age, and this was before 1939. The terrible events of the following years did not bring on a recurrence in this patient. He continued to keep his mental balance in spite of terrible circumstances till he died many years afterwards of another illness.

It also happened the same way with another patient admitted recently to my hospital, who, following herpes zoster treated by antibiotics, presented symptoms of mental agitation, turbulence, egotism, and was diagnosed by the specialist as an advanced senile

[illegible]

to sustain his circulatory state
and attention to minor details.
complete cure was obtained.
led to an unexpected therapeutic cure.

These few examples show, therefore, the important problems in psychiatric treatment of the aged, problems which are still not very well known. We encounter more serious syndromes when we are faced with real dementia states in which there exists undoubtedly weakening of all the mental faculties with changes in memory; manifestations of presbyophrenic syndrome of Wernicke, and frequently aphasic symptoms more or less dissociated, and often manifestations of Pick's disease and Alzheimer's disease.

In all these cases where it is possible to demonstrate by special examination, like encephalography or ventriculography, the presence of organic cerebral changes affecting the frontal and other lobes leading to cortical atrophy, the immediate reaction of the physician is to think in terms of structural lesions. It is a great mistake in medicine to bring into the realm of clinical observation factors which belong to the realm of histopathology. In fact it is unnecessary to think that because of the presence of cortical atrophy more or less distinct, the clinical condition is irremediable and beyond all resources of treatment. This has been proved by experience. We have a great number of patients with obvious lesions whose condition has been greatly improved by treatment. In fact in order that this treatment can give a good result it is necessary that the doctor should believe in the reality of this therapy and should not be impressed by pessimistic theories which annihilate all his efforts. It is very frequent with old patients when their dementia is far gone, to use an expression of Scipion Pinel, that the "consciousness of the heart" of these patients is frequently retained whereas "consciousness of intellect" is gone. We could give here the example where a patient of this kind who appears to be disorientated, indifferent to his environment and relations, is brought into hospital and is frequently observed at the very moment of arrival into the hospital to be very happy and appears not to regret this transfer, but after a few minutes, as soon as his relatives have gone, he starts to cry. He thinks he is back in his home and has intense affective reactions. This shows that from the intellectual point of view the patient is not aware of the change in his surroundings, but is aware from the affective point of view. The patient, without knowing by his intelligence that he is in hospital, feels he is in hospital. He feels that he is separated from his relatives and he reacts emotionally. The idea of this consciousness of the heart which is so important is of the greatest interest in relation to therapeutic and psychotherapeutic methods in treating aged people.

In consequence it is absolutely essential to be gentle and understanding in the care of the smallest details, and we have always endeavoured to educate the staff of our department in meticulous detail in this respect. Psychotherapy in itself, therefore, is useful

in old people, but it must be used with tact and delicacy. Apart from senile dementias and their varieties, another problem is the psycho-organic syndromes with focal lesions. These syndromes present many difficult problems; for example, the pseudo-bulbar patients who have been described by Brissaud and the great neurologists of the past century. Pseudo-bulbar diseases present symptoms of forced crying and laughing, the *demarche à petits pas*, cranial nerve lesions, disturbances of phonation and deglutition, and also [illegible] This is not only depressing for the

[illegible]

mentally cannot control their emotional reactions and often, besides the affective symptoms, there are also symptoms of delirium accompanied by signs of weakness of intellectual function due to extension of the lesion.

These diseases, therefore, have to be treated very carefully and particular attention should be focused on the defect of deglutition. It is essential to make the patient eat, which is of first importance; and we find from this point of view that such minor details are of great importance in the therapy of old people. That is why the slightest details must be watched carefully, and the nurses have a decisive role in the therapy. Besides these pseudo-bulbar syndromes there are also patients affected by cerebral softening, patients with hemiplegia, or patients with aphasia. The problem of the aphasia with all its variations requires very great care and even at that age may be the object of re-education, but in any case what is really important is that these patients are aware of their own aphasia and they are very sensitive to the reactions of people around them. We [illegible] characteristics of mental

[illegible]

of its control. The old people on the contrary, [illegible]

[illegible]

body. This effort that the patient makes to hide from other people his condition is also an effort to deceive himself in order not to be ashamed or resented by others, and therefore it is necessary that the physician in such a case does not break up the façade, and he must have the delicacy and sympathy and sufficient love for the patient not to make him feel the disturbances and changes of his cruel illness, not giving the patient the impression that he is simply an object of study but, on the contrary, showing the complete sympathy and understanding which is the basis of the treatment of the aged.

As we have seen this treatment of the aged carries not only a considerable moral element but attention to the least detail in the physical care, and that is why we speak of meticulous care in this

respect up to the smallest detail which might have a vital effect on the patient and can influence life or death.

Particularly this happens in the management of bed-sores. We must remember that before Pierre Marie bed-sores in old people were considered to be manifestations, trophic changes due to anatomical lesions of the nervous system, for which nothing could be done. Contradicting these conceptions, Pierre Marie has shown that these bed-sores were not the effect of organic changes but that the cause of them was due to a great extent to local conditions and insufficient attention regarding the teguments of the regions exposed to pressure; and when he established in his department more meticulous care to avoid maceration and irritation of the skin, to keep the good nutrition of the tissues, he helped a great number of bed-sores to heal. We ourselves have seen that such care is of capital importance, for the greater part of bed-sores may be avoided when sufficient attention is given by competent and devoted persons. Again, this great care must be given to the minutest details and one must not forget to use even the old recipes—for instance aromatic spirits, which assists the toilet of the areas submitted to the danger of bed-sores, avoids the maceration of the skin by water, and increases the vitality of the tissues.

Summing-up and concluding this paper, we see that neuropsychiatry of the aged presents numerous problems which depend on essential principles. These principles are as follows:—

1. The treatment of the old people and the neuropsychiatry of the old people more than any other branch of medicine requires a moral approach and moral concept which consists of love of the patient; and in fact, the attention must be focused to serve the patient, to love him, to cure him if possible, and to prolong his life as long as possible. This moral concept must be very far from the concept of utilitarianism, which considers the patient as an animal or an object for recuperation and which neglects the laws of eternal medical ethic.

2. Equally, the doctor who is engaged in the treatment of the aged must understand the preoccupations of the old people, must understand the care he takes to keep up appearances, must avoid [illegible] above [illegible] the idea that it [illegible] are old.

I would like to quote here the words of the Old Testament: " Have respect for my white hairs and honour the aged." It is upon

this foundation that geriatrics rest, and this applies in every age and every time.

To conclude we consider that it is worth while making a great social effort to organise neuropsychiatry of the aged, and it is indispensable that there should be in all mental hospitals a special [illegible]

psychiatrists, a false view which, to a great extent, is due to the unjustified development of shock treatment and which involves that the psychiatrist loses the human spirit which is the background of all functions of medicine.

We believe that the mental hospital, which must be a mental home, must have different departments and must treat alike acute and chronic cases as well as the aged.

LOEFVING, BARBARA, London. *The diagnostic value of some memory tests with selected groups of senile patients.*

[illegible]

discrepancy was found in some cases between the clinical diagnosis of memory impairment and the results of the psychological tests, it seemed desirable to determine on what evidence the clinical assessment of memory had been based. It was found (1) that some unstandardised memory tests (such as recall of a story, repeating digits, etc.) are used by the clinicians in the assessment of memory impairment; (2) that this assessment is largely based on the patient's ability to an [illegible] cent personal and well-kn [illegible] ever, did not provide an [illegible] assessing the patient's per [illegible] gained from the clinical [illegible] at some tests were used whose designation as [illegible] is somewhat uncertain. For instance, Eysenck and Halstead (1945) found no [illegible]

observations and to evaluate further the clinical method of memory assessment.

The objects of the project have been as follows:—

1. [illegible]
2. [illegible]

of memory impairment is based. For this purpose three questionnaires on memory for past and recent events were devised.

3. To develop a set of short tests which would provide an objective measure of such specific failures of memory as had been observed in the pilot study. These were, for example, an inability to remember the hospital routine and difficulties in orientation in the ward or the immediate environment, which, of course, are most relevant to the patient's daily life.
4. To select a few formal tests, which on previous evidence would be expected to test some aspects of memory, at the same time as they might help in differentiating " organic " from " functional " patients. For this purpose a test of new learning (of a simple word-material), a test of retention (of the same word-material) and a test of reproduction of six visual designs (after L. Bender) from copy and from memory were included.
5. To determine the diagnostic value of the above tests in differentiating " organic " from " functional " patients.
6. To investigate the relationship between the clinical tests and other tests of memory on the one hand and intelligence on the other; *i.e.*, to find out to what extent the various measures of memory correlate with each other and still intercorrelate when the influence of intelligence test scores has been removed.

Since the research has not as yet progressed beyond the fifth object, only this will be considered here (*i.e.*, the diagnostic value of the various memory tests in differentiating " organic " from " functional " patients).

The tests were administered to a group of psychiatric patients over the age of 60, who were admitted consecutively to the geriatric unit of the Bethlem Hospital over a period of about one year. The patients were tested individually by the psychologist and independently rated by Dr Post as falling into one of the three following diagnostic categories:—

1. Psychiatric patients with evidence of cerebral pathology (" organic ").
2. Psychiatric patients without evidence of cerebral pathology (" functional ").
3. Psychiatric patients with dubious evidence of cerebral pathology (" doubtful ").

[illegible] was
[illegible] natic
[illegible] d as
[illegible] ered
doubtfully " organic," and twenty-six definitely " organic."

Means, range, and standard deviations on age, education, and intelligence level were approximately the same for the three groups.

The significance of differences between the three means for each test was estimated by means of an analysis of variance technique. Most variables were found to discriminate between the three groups at the 0·01 or 0·001 level of confidence.

One possible factor which could have accounted for the discrimination between the groups had to be considered. Although

same information as that obtained from some of the formal tests.

beyond the 0·01 level of confidence. However, the direction of change was consistent with the proposition that there had been some contamination of test results and clinical diagnosis which might have affected the results. Another analysis of variance was carried out to check this possibility.

The results of the second analysis of variance were similar to those

level were, apart from the test of intelligence, the tests of learning and

as there is evidence from various sources that the ability to repeat digits is usually unimpaired even in a setting of dementia (Botwinick and Birren, 1951 *a*, Roth and Hopkins, 1953).

The same conclusion would seem to apply to the tests of retention in this study. Once the material had been learnt to a criterion of

variance between the groups) were largest for the following tests :—

1. *The reproduction of six visual designs from copy.*
2. The questionnaires on memory for hospital routine and orientation on ward, totalled.

3. A questionnaire on memory for the first testing session.
4. A small clinical test of orientation for time and place.
5. A questionnaire on memory for remote personal events.

It is significant to note that some of the small tests concerned with orientation for time and the immediate environment were found to discriminate between the groups, whereas most of the clinical tests did not. Only very few investigations are reported which are concerned with test performance on such simple tests in sen[illegible] with those obtained by [illegible] disc[illegible] and a group of affective psychotics.

Another interesting finding is that in the "organic" group the [illegible]

memory is usually confined to recent events. It seems that, although a patient can recite many events of his past life, his reports are often vague or inexact when submitted to systematic testing.

In essence, then, the results suggest that the performance of patients in some of the memory tests used in this study provides objective and independent support for the differentiation between "organic" and "functional" disorders in the elderly based on an evaluation of neurological findings and objective data. In particular, they suggest that tests of such aspects of memory function as we have called orientation for time, the immediate environment, and certain personal and well-known general events, might be more appropriate tests of dementia in old age than the clinical tests in current practice and more conventional tests of learning and retention. In addition, the discrepancy between the results of the first and second analysis of variance is of methodological importance. It suggests that the classification of patients in many studies of this kind may be insufficiently subtle or objective, and that differences in test scores might often be due to some contamination of test results and clinical diagnosis.

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PAMPIGLIONE, G., and POST, F., London. *The value of electroencephalographic examination in elderly psychiatric patients with suspected brain lesions.*

WHILE cerebral arteriosclerosis can run its course towards complete personality deterioration and dementia in a slow and insidious fashion, in many cases neurotic, depressive, paranoid, or confusional

reactions occur at an early stage, and these may be mistaken for psychiatric reactions of the elderly due to emotional or other psychological causes with good immediate and ultimate prognosis. Alvarez drew attention to the frequency with which " little strokes " are overlooked when occurring in a setting of apparently functional psychiatric illness, though they are a clear indication of an underlying cerebral-arteriosclerotic process.

At the Geriatric Unit of the Bethlem Hospital patients over the age of 60 are admitted for the investigation and treatment of psychiatric disturbances mostly characterised by neurotic, depressive, or paranoid reactions, and the question whether and to what extent these may have been facilitated by arteriosclerotic or other pathological processes in the brain arises in many cases.

In the last three years a series of 102 patients with an age range from 62 to 81 years was referred for electro-encephalographic investigation. All these patients, in addition to their main psychiatric illnesses, had a history suggestive of strokes or doubtful cerebral attacks with, or usually without, abnormal neurological signs. It was felt that a clinical follow up of at least one year in this age group could be considered sufficiently satisfactory for judging initial diagnostic and prognostic impressions. The first forty-two patients of the present series were followed for a period of twelve months or more, and on these cases the present contribution is based.

The EEG examination was carried out in each case in the resting state, during overbreathing, during photic stimulation, and during the effects of a relatively quick-acting barbiturate (drowsiness and sleep). This rather elaborate examination was planned in order to obtain detailed information both for detecting possible cerebral lesions and for collecting data about the range of normality of EEG changes in planned conditions and stimuli in this age group.

It was found that normal alpha rhythm could be present irrespective of age, strictly comparable to the standards of normal adult age groups in frequency, amplitude and response to sensory stimuli. Even in cases with focal EEG abnormalities the traces from other areas may appear quite normal for adult standards. Overbreathing was found of little value as it was rarely well performed by our elderly patients. Photic stimulation was not always well tolerated, and some of the patients worried about its effect on their eyes. Constant asymmetries in the EEG responses to flashes of light were clearly seen in two patients with otherwise normal EEGs with large visual field defects probably related to an old posterior cerebral artery thrombosis. Inconstant asymmetries in the EEG responses to flashes of light were found in five other patients without gross visual field defects. Some irregularity in the EEG responses to photic stimulation was found in fourteen patients, a relatively high proportion in comparison with normal adults. In two the irregularity was gross, with appearance of large spikes, sharp waves, and slow waves. Neither of these patients had a history of seizures. Some of these irregularities might be interpreted

as related to variation in the amount of night sedation in the nights preceding the test.

The administration of a relatively quick-acting barbiturate after the routine EEG was planned for four reasons: sedation of restless patients, facilitation of the appearance of EEG abnormalities during various states from alertness to sleep, study of the distribution and symmetry of induced fast activity, and study of sleep patterns and

that some frontal atrophy might have been present. This inference was made from other cases of proved frontal atrophy with similar EEG features. The barbiturate-induced fast activity, as it is known from previous work, may be absent or diminished over atrophic or ... than deeper ... in ... ical

Sleep ... ted than those seen ... commonly ...

K complexes followed in most cases a sensory stimulation with a morphology and distribution similar to that of adults (not of children). On several occasions asymmetries of K complexes were seen, but these asymmetries were usually variable. It seemed important to repeat sensory stimuli more than once at intervals of at least thirty seconds in order to assess the constancy of such asymmetries. A constant asymmetry was considered of additional lateralising value in the interpretation of the EEG abnormalities, possibly in favour of either extensive or deeply situated lesions.

The results of EEG investigation were compared to the degree of suspicion of cerebral pathology (strong evidence, A; suspicion, B; ... al (N), ... shows our results.

TABLE I

RANGE OF PROBABILITY OF LESIONS

	N.	M.	G.
A . .	0	6	8
B . . .	2	8	4
C . . .	8	6	0

In Table II the EEG's were rated in the same way and compared to the outcome of the patient after a follow up of at least one year.

TABLE II

RATING FOR OUTCOME *

	N.	M.	G.
A	2	7	0
B, C, D, E .	6	13	14

* Patients' outcome was ranged in five degrees. A—at home and symptom-free; B—at home with mild psychiatric symptoms; C—at home with more severe symptoms (functional and organic not always distinguishable); D—under psychiatric in-patient care, either still or again, E—dead.

These results suggest some inverse correlation between the degree of EEG abnormality and the favourable prognosis.

ROBINSON, R. A., Dumfries. *The correlation between EEG abnormality and senile arteriosclerotic organic deterioration.*

The question of how far the amount of abnormality found in the electro-encephalograms of elderly patients is related to the degree of mental deterioration present is still under debate.

The evidence from the literature is conflicting, although there is a general impression that some correlation does exist.

The present contribution is based on the clinical and EEG examination of forty senile patients in the Crichton Royal Mental Hospital, Dumfries.

[illegible]

distinguish signs arising in organic mental deficit from those related to functional psychiatric disorders. Thus, inability to co-operate in examination from causes other than intellectual deterioration is a source of discrepancy.

This investigation has been confined to a fairly homogeneous group. All the subjects were suffering from simple senile or arteriosclerotic dementia. Cases showing predominantly paranoid or depressive features were excluded.

The material consists of forty hospitalised patients (eighteen males and twenty-two females) over the age of 70 years. The age range was from 71 to 93 years, the average being 81 years. The duration of illness could not be accurately determined in all cases. The range in those for whom there were fairly reliable data was from one and a half to eleven years, the average being 5·4 years.

In none had the illness commenced before the age of 65 years, nor was there any known history of previous psychiatric disability. None of the patients showed any evidence or history of epileptic attacks, cardiac decompensation, or cerebral focal lesions. Most were ambulant for at least a part of the day. A few of the more helpless, however, were unable to move unaided.

This rigorous selection accounts for the small size of the group studied. It also probably resulted in a preponderance of those suffering from senile dementia as many arteriosclerotics were presumably eliminated.

Clinical assessment—No formal psychometric tests were employed because the more severely deteriorated patients would have been untestable by the usual methods.

At first a psychiatric examination of traditional type was attempted on each patient, and each was also physically examined. It was found that though the patients formed a continuous series of deterioration, there was little difficulty in assigning each to one of three groups—"mild," "moderate," or "severe," according to the degree of deterioration found. This preliminary classification depended on clinical impressions only. Successive patients were positioned within the various groups according to my lingering impressions of their predecessors.

It was soon found possible to define a status typical of each group; thus the mildly deteriorated patients were well orientated in all spheres. They showed only minor defects of both recent and remote memory with the simple tests used. All knew their respective ages and how long they had been in hospital, and showed a fair knowledge of the outstanding current topics of national and local interest. They were able to deal with simple arithmetical problems, and some completed the Serial Sevens subtraction test (though in every case with at least a few errors). Almost all were engaged in productive activity as defined later.

In the "moderate" group there was poor orientation with marked recent memory defect and confabulation. Arithmetical ability was at the level of "How many threepennies in a shilling?" The interview situation was fairly well appreciated and attention was well sustained. Most of them made spontaneous mention of their failing abilities.

With the severely deteriorated, only poor rapport could be established, replies were often vague and nonsensical, and spontaneous talk consisted of disjointed, incoherent ramblings. They were incontinent (often doubly so) and had to be dressed and washed and sometimes fed. All were completely disorientated.

When an attempt was made to abstract those features which seemed most significant and which could be determined quickly, the following seemed to be most useful:—

Memory—This was divided in accepted fashion into recent and remote: "How long have you been living here?" *i.e.*, the duration of stay in hospital, was the test question for recent memory. If

this was not known, knowledge of significant happenings within the same span was accepted. A knowledge of the place and date of birth and school attended were required for remote memory. Confabulation was often elicited by these questions and, if present, was noted.

Orientation was considered in several aspects. Temporal orientation was sought in straightforward questioning as to day or date, month, and year. Situational orientation was covered under the heading "Status," which was designed to show whether the subject knew he was a patient in a mental hospital (and therefore also included "Insight"). Answers such as "A place for looking after folks" were accepted. Geographical location or designation was not insisted upon.

An appreciation of the interview situation—that the patient realised he was being asked questions by someone interested in his welfare—was accepted as orientation for persons.

Each patient was also asked his age (this again covered both temporal orientation and insight). Answers correct to the nearest decade were accepted. This seemed a particularly significant question. Again in the field of insight a rather surprising and significant feature was the number of patients who admitted spontaneously that their abilities were failing. This disclosure [illegible] iven.

[illegible] erseveration,

[illegible] oncentration

and Attention."

Disturbances of consciousness and spontaneity were considered under "Rapport."

The patients were also asked about their activities and interests; their answers, when checked later with the nurses, were a fruitful source of confabulation and fabrication. Those patients who read novels or newspapers, listened appreciatively to the radio, and watched television were considered active. Under productivity was listed ward work, knitting and sewing, other forms of occupational therapy, and helping other patients less able than themselves.

A knowledge of current affairs was sought for. Here, particularly, the standards of acceptance of an answer had to be gradually lowered in order to include even the "moderate" group. The final level was, "What monarch is on the throne?" and "Who is the Prime Minister?" A knowledge of local football results and [illegible]

[illegible]

shilling, threepennies in a shilling, and threepennies in 3s. 9d. The

Serial Sevens subtraction test was also used. If an unusual degree of confusion or perplexity appeared during the tests a note was made of it.

The prevailing mood of the patient during interview was noted briefly. Emotional incontinence or lability were particularly looked for. This completed the interview.

The patient's mental state was then discussed in general terms with the nurse. In particular, information was sought regarding *his activity and productivity. It should be stressed that this refers* to purposeful activity and not the aimless restlessness so often found in severely deteriorated patients. Note was also made of the patient's habits, *i.e.*, whether he could dress, perform his toilet and feed himself, and whether he was frequently incontinent in the absence of any obvious cause.

Finally, inquiry was made as to whether the patient was able to recognise his nearest relatives when they visited. If he had none, then whether he tended to misidentify the nurses with whom he was habitually in contact.

These, then, were the details which were finally chosen and on which the assessment of deterioration was made.

Interview—This was always made as flexible as possible, except that the basic questionnaire was covered in each case. The aim was to maintain as far as possible an attitude of give and take. The *arithmetical problems were never introduced until the* end lest the picture should be complicated by the confusion which the tests sometimes produced.

EEG assessment—A quantitative assessment of the various frequencies appearing in the EEG was made by Dr McAdam. This was subdivided into three grades of mild, moderate, and severe according to the amount of low-frequency activity present.

In the mild grade the features of a normal record were preserved, but there was an excessive amount of low-frequency activity of mild degree.

In the second grade the features of a normal record were obscured by low-frequency activity, although they could still be revealed by the use of filters.

In the severe grade there was continuous low-frequency activity and a completely disorganised record. Finally, the records were ranked according to the amount of low-frequency activity present.

FINDINGS

When the EEG and clinical findings were compared, it was apparent that the [illegible] It was then attempted to [illegible] scoring each patie[illegible] point was given to [illegible] these points. For [illegible] liabilities, namely, confabulation, emotional lability, confusion

under stress, and misidentification of relatives, a point was subtracted from the score. The score was used to determine the ranking order. The figure expressing the level of deterioration was found to be related to the amount of abnormality in the EEG. This correlation proved statistically significant at the 0·01 level.

HOPKINS, BARBARA, London. *Comparison between transient and permanent states of altered consciousness in elderly patients.*

ELDERLY patients admitted to mental hospitals are often called confused, restless, and disorientated. They are usually brought to hospital under certificate without any information about the history of the illness. Later it is found that some have been dementing for a long time; these continue to dement. Others have signs and symptoms of an arteriosclerotic psychosis. Then there is a third group, in which the confusion is of acute onset, and in which there is no history of intellectual deterioration before the illness. About half of this group of patients die quite soon after admission, but about half recover from the confusional state and are discharged from hospital within a few months.

When there is no history, it is difficult to tell to which group a patient belongs. It is not always easy to distinguish between them on clinical grounds alone. But we had found earlier that patients with an acute confusional illness did better on psychological tests than did demented patients. In this first investigation, consecutively admitted patients had been given psychological tests and afterwards allocated to five diagnostic categories. These were affective disorder, late paraphrenia, arteriosclerotic psychosis, acute

secutive admissions, to check

of admission, but for

was made several months later, when the available material included social histories, complete medical records, and follow-up studies by a psychiatric social worker. In every case the final diagnosis was made by Dr David Kay.

At least three tests were given to each patient, but I am only going to consider one of them. This is a questionnaire made up of

limited aspect of a person's contact with his environment, but this

st disturbed patient and
when more elaborate
psychiatric examination

are often impossible. If we try to compare patients on standard psychological tests, several have to be excluded because they are unco-operative, or physically unfit, or disturbed in behaviour, or have sensory defects. Some demented or confused patients cannot even understand or remember the test instructions. So with the sort of patient we were examining, this was the only test procedure that could reasonably be taken into account in all cases. Even so, some patients were so seriously out of contact that they could either not respond at all, or gave random answers even to the simplest questions. But we did know that this type of response had a definite significance. We had already found that patients responding in this way were either advanced dements, or cases of acute confusion who died very shortly after admission.

The second reason for making use of this test was that it had already been given to an earlier series of patients, and we knew that in senile psychosis the range of test scores was very limited. No senile psychotic patient in the earlier series had answered more than six out of the twenty items correctly. This means that it was possible to use that score as a cut-off point, and any subsequent patient's score could be classified according to whether he fell within the range for senile psychosis or above it.

Patients in the senile psychotic group had a previous history of progressive impairment in personality and intellect, and an insidious onset. In some cases, of course, the cause of admission was an accentuation of symptoms such as restlessness, wandering, or hallucinations, which made them impossible to manage at home. Although the more florid symptoms sometimes subsided, the subsequent course of the illness was dementia without remission.

Patients in the acute confusional group had a sudden onset, and had no history of deterioration up to the time of the illness. Nor did they become demented during the time of observation after admission, which was at least six months in all cases.

Patients who died within a month of admission have been excluded from the figures, because there was no definite evidence that they would not have demented had they survived. Four out of twenty-six cases of senile psychosis and seven out of twenty-one cases of acute confusional state died less than a month after admission.

Only one patient refused to co-operate. This was a case of acute confusion with marked paranoid ideas.

There remained the following patients.

In the senile psychotic group there were three men and nineteen women, with a mean age of 78 years. Three were voluntary patients and nineteen were under certificate. The status of these patients six months after admission was: Died in hospital, 5; in-patients, 14; discharged and living, 3.

In the acute confusional group there were six men and eight women with a mean age of 73 years. Two were voluntary patients, the rest were under certificate. Status six months after admission

was: Died in hospital or after discharge, 3; in-patients, 3; discharged and living, 8.

Response to the test questionnaire was classified according to whether the number of correct answers fell within the senile psychotic range, which we had previously established, or above it. Eleven of the fourteen cases of acute confusion—that is, four-fifths of the

completely differentiated by the test.

Some patients in the acute confusional group made scores which were no different from those of patients with purely functional psychiatric disorders. This was because at the time of testing the confusional state had already cleared or was clearing. So we were sometimes concerned with patients who had suffered from an acute condition, and not with the condition itself. I would like to stress, however, that these were patients who only a few days before testing had been admitted to a mental hospital with an acute illness, as certified patients or under an urgency order.

This suggested that the medical records should be examined with the idea of finding how long the confusion lasted in these conditions of acute onset. We took as confusional symptoms such generally accepted features as restlessness, disorientation, inconsequential talk, and hallucinatory and delusional experiences. The duration of symptoms of this kind was less than a week after admission in five cases, and less than two weeks in another five. The duration in the remainder varied from one to four months.

clearing confusional state. A ission as "confused and very way." He said that he was in a garage, and thought he had been here for ten weeks. He for a long time. "Yesterday he was totally dis- is car. To-day He is correctly orientated and realises that he has been mentally ill." This patient was given psychological tests one week after admission. At this time he had an amnesia for the acute stage, but his test performance was above the average for patients of his age suffering from purely functional disorders.

Even when the symptoms persisted for more than a few days, evidence of the transitory nature of the confusional state appeared very early on in those patients who were later to recover. This evidence could be found both in the medical records and in the patients' responses to psychological testing. Often the patient was quite lucid during the daytime and became disturbed and disorientated

only in the evening. One patient at the time of admission was described as "drowsy and variably confused." Later he became very restless and kept throwing off the bedclothes and his pyjamas. Three days later he was quiet during the day and talked sensibly. The same day he was able to attempt psychological tests in the morning, though some of his talk was perseverative and incoherent. The same afternoon he was almost completely incontactible and poured out a stream of disconnected talk. For several days afterwards this patient, who was a road-mender, was quiet and sensible during the day, but at about 5 o'clock began to dig holes in the road.

Patients who were tested at this time, when their contact with the outside world was fluctuating, made lower scores than patients without any confusional symptoms, for instance, affective and paranoid disorders. But the point I want to emphasise is that even when they were very disturbed, the majority did not makes scores as low as patients with a permanent and irreversible dementia. It sometimes appeared with these patients that the questioning itself increased their awareness. There was often a marked discrepancy between their answers to the actual questions and their spontaneous talk and behaviour.

There was, of course, some fluctuation in the condition of the senile psychotic patients, but it had a different quality. It was mostly a variation between restless and sometimes aggressive behaviour, and passive co-operation. There was no mention in the records of periods of lucidity or of correct orientation. There was no evidence of any real grasp by the patient of the situation in which he was.

These observations suggested that a degree of contact with the outside world which falls below a certain level is a characteristic, not of confusion, but of dementia.

If this is true, the degree of contact with the environment should be significant in those illnesses in which both dementia and acute confusional [illegible]
psychosis. [illegible]
dementia ra[illegible]
is so, an a[illegible]
range for senile psychosis might be expected to have a less favourable outcome than a patient whose score fell within the typical range for acute confusion. We found that there was, in fact, a relationship between the status at six months after admission in arteriosclerotic psychosis and the score on this test. Again, leaving out patients who did not survive beyond one month of admission, there were twenty-three cases of arteriosclerotic psychosis tested during the same period. Eleven patients made scores which fell within the range for senile psychosis. None of these was discharged from hospital within six months, and seven had died during that time. Of the twelve patients who made scores which fell above this range, eight had been discharged from hospital and were living six months after admission and only one had died. So while the ultimate prognosis

for arteriosclerotic psychosis is poor, the maintaining of a degree of contact above the senile psychotic level does seem to influence the immediate outlook. It does make it probable that the patient will be discharged, at least for a time, from mental hospital care.

KAY, D. W., NORRIS, VERA, and POST, F., London. *A study of prognostic indicators in the psychoses of the elderly.*

THERE is general agreement that old people with terminal confusional states or with simple senile deterioration ought not to take up mental hospital beds and that, on the other hand, up-to-date treatment facilities should be available to the many elderly patients with recoverable mental breakdowns. However, opinions on the period of observation required to decide on prognosis and therapeutic possibilities vary widely—between six weeks and three to four months.

This investigation was carried out to test the opinion expressed by one of us, on the basis of experience in an out-patient clinic, that a useful assessment could be made much more rapidly. It was

progress of 217 patients during one year. The results of our assessment were entered within the first ten days on a card. The following

so-called confusional state. On account of the loose way in which

symptoms" such as dementia, permanent deterioration of habits and personality, and a tendency to euphoria or emotional lability. Patients were classed as either mildly demented or as definitely demented on the basis of history and examination.

Finally, the two clinical investigators by agreement committed themselves to definite predictions with regard to duration of life,

and length of hospital stay. Death and social recovery were forecast to happen within one month, two to three months, four to twelve months, or not within the first year. As, not surprisingly, we failed to predict future events at this over-ambitious level of accuracy, it is unnecessary to set out in detail the prognostic criteria used. Briefly, the chances of survival were assessed as good in the presence of fair physical health and the absence of positive psychorganic (confusional) features; as poor, in cases of serious physical illness and persistent confusional symptoms. It was thought that men would show a greater mortality than women. Social recovery was thought unlikely when early death was expected, and also where patients had been living alone or had been leading an isolated existence; also in the presence of definite dementia or of paranoid symptoms unless these had occurred suddenly or in a depressive setting.

We failed to predict the patients who either died or recovered within the first few months of admission, but the less ambitious predictions that patients would die or recover within the first year were much more successful. We succeeded in selecting correctly 85 per cent. of the patients who survived the first year and 71 per cent. of those who made a social recovery during that period. If decision on disposal of patients had been in our hands, we should have recommended planned psychiatric treatment in all cases where we thought social recovery likely, and this would have proved correct in at least 71 per cent. Also, we should have been highly successful in selecting the patients who would both survive and fail to recover within the first year, and therefore require a relatively long period of nursing care and supervision rather than the specialised treatment provided in psychiatric hospitals.

Turning to the second aim of the investigation, we attempted to determine which features recorded at our original assessment might prove to have been of prognostic value in the light of the known outcome; we also tried to show whether we could have achieved with these indicators reliable predictions of the outcome during the first few months after admission. We shall only summarise the findings confirmed as statistically significant by Dr Norris during her analysis and briefly comment on some of them.

Evaluating factors affecting survival, the expectation of a higher death-rate in men was confirmed, and this was due to a heavier incidence among them of serious physical diseases. It was not surprising, perhaps, that cardiovascular disorders were less common in these mentally ill old people than findings pointing to damage of the central nervous system; but the discovery that neurological abnormalities had a more serious import in shortening life than cardiovascular disease, including many cases with heart failure, was unexpected. It reminds us of the indispensability of an intact brain for the survival of the organism even at the low level of existence seen in dementia. In parallel, we found that duration of life was shortest in those psychoses which are deemed to be associated with the most severe degree of cerebral dysfunction: the simple

dementias. The presence of confusional (positive psychorganic) symptoms was confirmed to be an unfavourable prognostic factor. Among patients who had remained sufficiently well integrated intellectually and emotionally to react with neurotic, affective, or paranoid behaviour patterns even in the presence of organic mental symptoms, death was much more frequently delayed; its occurrence was rare during the first year in the functional group of patients

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s did not

affect prognosis. Domestic arrangements, such as living alone or in a public institution, very surprisingly had no effect on the advent of social recovery, but especially after the age of 70 complete social isolation militated severely against its occurrence. Within each diagnostic group we found a tendency for the younger members to have a better prognosis than their elders, but regardless of age the psychiatric diagnosis, even if only in terms of functional, organic, ... was confirmed to be a valuable prog-

appears to be evidence for a degree of personality preservation which makes recovery at the social level still possible. By contrast, early dementia seems to possess less significance than the amount of attention which is so often focused on its discovery might make one suppose: in a small number of patients with functional symptoms

period.

Analysis of our findings suggested the following characteristics as indicative of a bad prognosis: Indicating early death—male sex, aged over 80, presence of central nervous system lesions, and absence of any functional admixtures. Indicating bad prognosis with respect to social recovery, we have the above, but age over 70, plus severe social isolation and the absence of a history of previous mental breakdowns followed by recovery.

A qualitative assessment of the relative importance of these six indicators is not easy in view of the large number of possible combinations in a relatively small number of patients. It has been possible to rank the combinations of indicators of early death in descending order of the death ratios within three months of admission, the period for which our original predictions had been so faulty. This is just one example of the way in which some combinations of these indicators influence the occurrence of early death and survival: nineteen men under 80 without lesions of the central

nervous system and with at least a few functional symptoms are contrasted with fifty-five men age over 80 showing, either singly or in combination, central nervous system lesions and absence of any functional symptoms. While with our present material we are unable to assess the relative importance of our six bad prognostic indicators for social recovery, it can be stated that the number of patients having a satisfactory outcome within three months of assessment is inversely proportional to the total number of unfavourable indicators which they present. More generally, but with a high degree of statistical significance, persons exhibiting none or only one of these indicators have a relatively good prognosis; those with five or six indicators a very poor outlook.

It is not suggested that the subtle clinical process of individual prognostication can be replaced by a primer of prognostic pointers. But we have tried to show that it is useful to pay attention to certain prognostically unfavourable points. Those we have defined are relatively easy to assess after a short period of observation, and this is particularly true of those factors which we think prognosticators of early death. Elsewhere Dr Norris has shown that 16 per cent. of male and 5·5 per cent. of female observation-ward patients over 65 died within twenty-eight days of transfer to mental hospitals; if, therefore, by making an informed guess about the likelihood of early death, we save some people unnecessary transfers, then a study of prognosticators is of value. Likewise, an early selection of patients who are most likely to recover from the current attack of mental disorder, and who would for this reason benefit greatly by admission to hospitals providing planned psychiatric treatment, is a goal worthy of attainment.

KAY, D. W., and ROTH, M., Chichester. *Physical illness and post-mortem findings in relation to different psychiatric groups aged 60 and over admitted to a county mental hospital.*

THAT physical and mental illness are closely associated, at any rate in later life, needs no emphasis. Dayton (1940) has shown that this is probably true at all ages; and in particular, that the rise in incidence of psychiatric breakdown with age parallels that of physical morbidity and of mortality in the general population. Detailed reports on the varieties and incidence of physical illness found among different groups of elderly psychotic patients are not, however, available. The object of this paper is to provide data based on a broad survey of a fairly large material aged 60 and over seen in a county mental hospital. More specifically the purpose is threefold. First, we wish to ascertain if physical illness can be regarded as a characteristic feature of one or more of four major clinical groups—Senile, Arteriosclerotic, Acute Confusional Psychoses, and Affective Disorder—which have been distinguished from each other on grounds quite unrelated to the physical condition (except that signs of central nervous system disease were one of the criteria for the diagnosis of

Arteriosclerotic Psychoses). If this is found to be the case, its

eventual outcome.

Description of material—Four hundred and five cases (Table I) were selected on the basis of diagnoses from 473 consecutive

TABLE I

ANALYSIS BY DIAGNOSES OF ALL ADMISSIONS AGED 60 AND OVER DURING A TWO-YEAR PERIOD

	Affective Groups.	Senile and Arterio-sclerotic Psychoses.	Acute Con-fusional States.	Totals.	Other Con-ditions.	Grand Total.
Males .	77	34	32	143	14	157
Females .	154	78	30	262	54	316
Totals .	231	112	62	405	68	473

admissions (excluding readmissions) aged 60 and over. Those rejected were neurotics, paraphrenics, and miscellaneous organic states, such as cerebral tumour and general paralysis. There were 231 cases suffering from affective disorder, and these form the bulk of the material (Table II). An important and interesting group

TABLE II

DATA ON FOUR GROUPS AGED 60 AND OVER, SHOWING RELATIONSHIP BETWEEN AGE, DURATION OF ILLNESS ON ADMISSION, OUTCOME, AND PHYSICAL STATE

Clinical Diagnosis.	Mean Ages.	Mean Duration before Admission (months).	Follow-up (one to three years).	Frequency of Physical Illness.
			Per cent.	Per cent.
Affective groups .	68·1	8·0	Dead, 9 Discharged, 83	47
Arteriosclerotic psychosis	73·6	19·8	Dead, 57 Discharged, 13	51
Senile psychosis .	78·4	46·7	Dead, 63 Discharged, 8	45
Acute confusional states .	72·7	1·9	Dead, 59 Discharged, 36	85

were the acute confusional states, which comprised over one-third of the organic psychoses. Among them were six cases only with alcoholic or epileptic confusion, and none due to bromide intoxication, so that these well-recognised syndromes did not account for more than a small minority of cases. Confusional episodes occurring during the course of the senile and arteriosclerotic psychoses were not, of course, included in this group.

These major clinical groups were originally differentiated on the basis of four independent criteria: the psychiatric and neurological status on admission; the duration of the illness before admission; the psychological test results, as described elsewhere by Hopkins and Roth (1953); and finally the outcome as determined by follow-up after one to three years. It was found that both the affective disorders and the acute confusional states differed from the senile and arteriosclerotic groups in mean duration of illness before admission, in psychological test scores, and in the pattern of outcome.

Physical illness—Objective data, such as laboratory findings and autopsy reports, were used whenever available. Difficulties arose far less often from lack of accurate information than from the nature of the comparison attempted. The concept of disease becomes less exactly defined as age advances, and the ages of the four groups differed considerably. Certain mainly degenerative conditions, whose limits of normality in old age are uncertain, such as osteoarthritis, atrophic emphysema, and defects of sense organs, were excluded from consideration for the purposes of this study. Thus, the overall incidence of physical disability tends to be underestimated among the organic, particularly the senile psychotic group. Central nervous system disease, with neurological signs, has also been excluded from the figures for the total incidence of physical illness, owing to the fact that it was one of the criteria on which the diagnosis of arteriosclerotic psychosis was based (the incidence of neurological signs was 60 per cent. among the arteriosclerotic group, 5 per cent. among the affectives, 14 per cent. among the senile psychotics, and 21 per cent. among the acute confusional states).

The total incidence of all types of physical illness (excluding the varieties mentioned above) was found to be as follows: affective disorder, 47 per cent.; arteriosclerotic psychosis, 51 per cent.; senile psychosis, 45 per cent.; acute confusional states, 85 per cent. Two facts emerge: (1) That the figures for three of the groups are of a similar order and cannot account for their very different natural histories; (2) that there is significantly more illness among the acute confusional states than in the material as a whole ($P = < 0.01$). It is concluded that physical illness is an additional characteristic of this group, differentiating it, together with duration of illness, test results, and pattern of outcome, from the remainder of the material.

To what extent is physical illness of ætiological importance in the various groups, and to what extent merely secondary or incidental to the psychiatric state, or related to other factors such as age?

shows that age is not closely related to the frequency of physical illness. Secondly, if intercurrent illness is more likely to occur, as a ... ressive mental ... fusional states ... on is only 1·9 ... ccount for the ... actual varieties of illness tends to confirm this conclusion with regard to the acute confusional states, and to indicate that the opposite is true among the senile and arteriosclerotic groups (Table III). Thus cardiac

TABLE III

INCIDENCE OF PHYSICAL ILLNESS AMONG FOUR GROUPS AGED 60 AND OVER ADMITTED DURING A TWO-YEAR PERIOD

(Figures in percentages)

	Neoplasms and Infections (with raised E.S.R.).	Urinary Tract and *Renal* Disease.	Cardiac and Cardio-*respiratory* Disease.	Post-operative and Post-infective States	Totals
Affective groups (231 cases)	**17**	10	16	14	47
Arteriosclerotic psychosis (63 cases)	22	19	29	10	51
Senile psychosis (49 cases)	29	18	12	**4**	45
Acute confusional states (62 cases)	**48**	**34**	**42**	**24**	**85**

Figures in heavy type indicates that differences from total incidence are significant.

and cardio-respiratory diseases (42 per cent.) and post-operative and post-infective states (24 per cent.) are both significantly more frequent among the former, and are probably of ætiological significance; among the senile psychotics post-operative and post-infective conditions are rare (4 per cent.), and minor infective conditions with raised sedimentation rate (29 per cent.), the commonest variety of illness, can be regarded as intercurrent. The arteriosclerotic group are intermediate in this respect (cardiac and cardio-respiratory disease 29 per cent., post-operative and post-infective states 10 per cent.).

Considering briefly each group in turn, it is apparent that the arteriosclerotic psychoses show the expected pattern. Signs of focal

cerebral involvement predominate, with cardiac disease as the next most frequent condition. At autopsy it is of interest that whereas cerebral atheroma was found more often than among the acute confusional states, gross renal arteriosclerosis was less common. With regard to senile psychosis, not only was the total incidence low, but the conditions found were often clearly intercurrent or secondary, and in particular cardiac disease was uncommon. We have therefore concluded that this psychosis is unrelated to systemic disease. Certainly it can occur in a setting of good physical health, and some cases survive under care for several years in an advanced state of dementia. Cerebral degeneration appears to be the primary lesion; diffuse macroscopic cortical atrophy was found at autopsy in six cases, but not in any of the other groups.

In the acute confusional states toxi-infectious conditions are common, but cardiac and cardio-respiratory disorders seem especially important (Table IV). The following conditions were found: auricular fibrillation, 16 per cent.; arteriosclerotic heart disease, 23 per cent.; cardio-respiratory disease, 10 per cent.; hypertensive heart disease, 8 per cent.; other cardiac conditions, 5 per cent. At

TABLE IV

VARIETIES OF CARDIAC DISORDER BASED ON CLINICAL AND AUTOPSY FINDINGS AMONG SIXTY-TWO CASES WITH ACUTE CONFUSIONAL STATES AGED 60 AND OVER

	Numbers.
Auricular fibrillation	10
Hypertensive	5
Cardio-respiratory	7
Arteriosclerotic	14
Other	3

autopsy gross renal arteriosclerosis is twice as common as among the arteriosclerotic group, but cerebral atheroma is less often found (the mean ages of the groups were similar). It is not suggested that the acute confusional states comprise a homogeneous group, but their common feature appears to be the presence of physical disorder not primarily located in the brain. In some cases disturbances in circulatory dynamics associated with cardiac arrhythmias or with heart failure may result in disturbances of cerebral circulation and metabolism, resulting in confusional episodes. The power of the organism to resist toxic and metabolic disorders seems to be impaired, probably as a result of degenerative changes due to age or to arteriosclerotic disease. Mental confusion arises when the degree of physical stress outweighs the organism's reserve powers of homeostasis; in some cases this occurs as a terminal state in a setting of prolonged physical illness, and at autopsy few signs of generalised degenerative change are found. In other cases confusion arises abruptly, during apparently normal health, and on admission to hospital physical signs may be limited to cardiac arrhythmias,

minor ECG changes, and perhaps signs of peripheral circulatory failure; at autopsy generalised arteriosclerosis is commonly reported. Detailed studies of circulatory and metabolic disorders among the psychoses of old age, particularly among the acute confusional states, are desirable.

The role of physical illness among the affective disorders is difficult to assess owing to the absence of comparable data from the general population or from other functional groups of similar age composition. Subdivision of the whole material into two groups shows, however, that among those who have fallen ill for the first time late in life there is a higher incidence of physical illness; among males this difference reaches the level of significance. We conclude that physical illness may be of ætiological importance for the occurrence of affective disturbances with onset late in life among males, but that it has less importance among females.

Physical illness and outcome—Among the affective disorders the number of deaths during the follow-up period, though much lower than in the other groups, is significantly higher than would be expected from the death-rates for the general population. Our evidence suggests that the psychiatric disorder directly (by suicide) and indirectly may account for about 25 per cent. of the deaths, and that physical illness is responsible for the remainder. Three-quarters of the patients who died had been found during life to be suffering from definite physical illness, *e.g.* coronary or hypertensive heart disease. It is important to note that in this group signs of cerebral involvement were minimal. Among the two groups where cerebral disease was known to exist (the senile and arteriosclerotic psychoses) the prognosis was poor; but this was not due to physical illness, the frequency of which was no higher than among the affectives and much lower [illegible] in both these groups the [illegible] senile and arteriosclerotic [illegible] disease processes but from [illegible] attributed to ill-defined causes, such as myocardial degeneration, generalised arteriosclerosis, or senility. Even among the arterio-sclerotics this was true in 60 to 70 per cent. of cases, cerebral catastrophes and coronary disease accounting for the remainder. In both these conditions it is progressive cerebral degeneration which is incompatible, first with social integration and eventually with survival. It appears that in some cases the organism succumbs to a vegetative death, and it is of great interest that diencephalic lesions in the vegetative centres have been described in such cases.

In the acute confusional states, where it is suggested physical illness was of ætiological importance, the outcome was, nevertheless, better than in either of the other organic groups. If structural brain disease was, in fact, responsible, through vegetative decline or other cause, for low survival rates, then the relatively good prognosis in the confusional states might be related to the absence of irreversible cerebral changes. Other evidence points to the

potential reversibility of cerebral disturbance; in particular few patients remained in hospital, death or discharge within three months being the usual outcome. This would hardly be the case if residual brain damage had taken place. Moreover, longer follow-up shows that many patients return to mentally active life. Even among those who succumbed in hospital, the degree of clouding of consciousness tended to fluctuate and even completely lucid moments occurred. We may conclude that mental clouding associated with physical illness is of serious import in patients admitted to mental hospital. Nevertheless, psychiatric interest should be centred on the fact that the psychosis is potentially reversible; improved methods of treatment may decrease the number of deaths while at the same time permitting more patients to be discharged from hospital, without increasing the number likely to be permanently of in-patient status.

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CONWELL, D. V., KURTH, C. J., and MURPHY, P. G., Kansas.
Use of psychological tests in determining the prognosis and treatment needs in geriatric mental illnesses.

In 1949 we began a study to ascertain if we could make psychological tests of greater clinical value. Improved usefulness of the tests would make them of more value in determining the prognosis and treatment needs of the psychiatric patients. After considering eleven tests, we designated the following three as the standard battery; the [illegible], the Minnesota Multiphasic [illegible] the Rorschach Test. During [illegible]) psychological tests were given. Serial and progress tests were made whenever possible. Ten per cent. of the tests were made on patients aged 60 years or older, and it is [illegible] made and treatment needs determined, (*b*) to give us an aid, through follow-up tests, in evaluating the patient's progress, and (*c*) to give us tangible material to supplement an opinion when showing the relatives the real needs. Our findings were of particular value in cases of geriatric patients in a psychosis. Previous to the use of insulin, any person developing mental illness past age 59 usually died soon or had prolonged hospitalisation. It is still generally believed that geriatric mental illnesses are caused solely by brain atrophy or arteriosclerosis, and therefore the situation is hopeless. The textbook sections on mental illness still foster the poor prognosis. This presumption, we are convinced, is not entirely valid. In our personal previous experience (1) modern therapy helped many

of the psychiatric oldsters; and courage, patience, and persistence on the part of the doctor and the relatives were vital factors in obtaining maximum results. It has been shown (2) that even elderly
may respond to
· of older people
eatment of that

group.

During this study, 141 geriatric patients with mental illnesses were given a total of 700 psychological tests. The diagnosis on all the patients tested, before we saw them, had been senile dementia. In the group were fifty-nine males and eighty-two females, in age of ... 60 to 64, sixty-three; 65 to 69, forty; 70 to

needed), and (c) no improvement. In considering data from the psychological tests it was deemed advisable to limit and group the information. Only the full-scale I.Q. of the Wechsler-Bellevue test will be used in our general consideration. In the MMPI of the aged the interest (Mf) and hypomanic (Ma) items are negligible. The hypochondriasis (Hs), depression (D), and psychasthenia (Pt) categories have so much in common that they will be classified as the D, or depression, trends. The hysteria (Hy), paranoid (Pa), and schizophrenic (Sc) items are classified as the Sc, or schizoid, trends. The Rorschach test responses are also classified into similar depression and schizoid trends.

Of the 141 patients in the study, forty-one presented evidence of organic changes, *i.e.*, arteriosclerosis, coronary thrombosis, chronic myocarditis, chronic nephritis, chronic encephalitis, or toxic goitre, or currently had influenza, ACTH therapy, pneumonia, or brain contusion. These will be referred to as the organic group. There was no evidence of somatic disease in the other 100 patients, who will be called the functional group.

Of the organic group, ten patients were seen at ages ranging from 62 to 80 years and averaged 71·7 years. Two were in the A stage, two in the B stage, and six in the C stage. Their I.Q.'s averaged 70 and their deterioration averaged 32 per cent. Confusion was the outstanding finding of the MMPI and Rorschach tests. Usually there was some evidence of schizoid and depression trends. The prognosis was very poor. These patients were considered to have senile dementia and permanent domiciliary care was advised. The average time for hospital observation, testing, and finding a rest home was thirty-five days.

The other thirty-one patients of the organic group fall into three

classes psychologically. In the first class the D and the Sc elements of the MMPI and Rorschach tests were most obvious. There were seventeen in this group and they averaged 68 years of age. Eight were in the A stage, two in the B, and seven in the C stage. Their average I.Q. was 93, and they showed little evidence of deterioration. The prognosis was fair. Treatment recommendation was electric shock treatments (EST) combined with insulin shock therapy and follow-up psychotherapy. Nine made occupational recoveries. Four of the nine (two A, one B, and one C) followed the recommended therapy and used an average of fifteen EST. Four (A) used insulin shock and psychotherapy, and one patient (A) used psychotherapy. Five patients made social remissions. Three followed the recommended treatment (one B and two C) and used an average of twenty EST, and two (C) used insulin shock and psychotherapy. Three patients did not improve (one A and two C). One used insulin shock psychotherapy and two used only psychotherapy. The group that recovered averaged sixty-six days in the hospital and the entire group averaged eighty-nine days. In this class emphasis must be placed on the importance of getting the treatment started early to achieve best results. The recovery rate of 53 per cent. compares favourably with similar illness in younger persons.

Twelve patients in the organic group showed depression trends as the outstanding findings in the psychological tests. They averaged 68 years of age. Six were seen in the A, two in the B, and four in the C stage. Their average hospital stay was forty-seven days. Their I.Q.'s averaged 97 and they showed little evidence of deterioration. A good prognosis was predicted. EST and psychotherapy were advised. Tonic insulin therapy was optional. Eight patients reached occupational remissions, seven of them (three A, one B, three C) followed the recommended treatment, and one (A) used psychotherapy alone. Two made social remissions, one (B) using the recommended treatment and one (C) using psychotherapy. There were two failures: one (A) used insulin and psychotherapy and one (A) used psychotherapy. The patients who followed the recommended treatment averaged twelve EST. Five of the patients in the acute and three in the chronic stage made occupational recoveries. In this class the occupational recovery rate of 66 per cent. was only fair. We must consider that the organic findings coexisting made organic brain changes a possibility even though the psychological tests indicated otherwise.

In the third class were two patients with epilepsy of recent origin who were seen at age 63 and 69. Both showed schizoid psychological patterns. The prognosis was poor. They were advised to use medical care, insulin therapy, and psychotherapy. One in the C stage followed the recommended treatment and made an occupational recovery. The other in the B stage refused treatment and did not improve.

Patients with psychiatric illness uncomplicated by somatic

disease numbered 100. Clinically, forty-nine had involutional melancholia, twenty-two had involutional psychosis, nineteen had reactive depression, three were psychopathic deviates, and one was

showed D as the predominant trend. The prognosis was good. They were advised to use EST and psychotherapy. Tonic insulin treatment was optional. This entire group spent an average of sixty-seven days in the hospital The twenty-eight patients in the A group averaged 65 years of age and averaged fifty-five days of hospitalisation. Twenty-six made occupational recoveries. There was one social remission and one failure. The latter used psychotherapy alone and the social remission followed the use of insulin shock and psychotherapy. Of the twenty-six patients who reached an occupational recovery, one used psychotherapy alone, four used insulin shock and psychotherapy, and twenty-one used the recommended treatment. They averaged eleven EST. There were thirteen patients in the B group. Eleven reached an occupational recovery, one made a social remission, and one did not improve. They averaged 67 years of age and required an average of seventy-seven days in the hospital. Of the patients who reached occupational recoveries one used psychotherapy, two used insulin shock and psychotherapy, and eight followed the recommended treatment. One social recovery and one failure followed the use of EST and psychotherapy. An average of seventeen EST were used. The eight patients in the C group averaged 69 years and spent an average of seventy-nine days in the hospital. Seven made occupational recoveries. They followed the recommended treatment and averaged eleven EST. One used insulin shock and psychotherapy and made a social recovery. The overall results are most encouraging in this group. Forty-five of forty-nine patients reached occupational remissions. This result compares favourably with the treatment

there was little evidence of deterioration. The psychological tests showed depression and schizoid trends predominating. The prog-

Eight of them (A) followed the recommended treatment and reached

and averaged eighty-nine days in the hospital. Two of these patients used the recommended treatment and made occupational recoveries. They averaged ten EST. One used insulin shock and psychotherapy and reached a social remission. The ten patients in the C group averaged 64 years of age and spent an average of ninety-eight days in the hospital. Three patients followed the recommended treatment and made occupational recoveries. Three patients made social remissions on using the recommended therapy. There were four failures. One of the failures used the recommended treatment, two [illegible]

complicated involutional psychosis is only 6 per cent. better than the sim[illegible]

[illegible] depression. They had [illegible] surgery, illness, or some shocking and unexpected bad news. They averaged 66 years of age and spent an average of fifty-one days in the hospital. Their I.Q.'s averaged 94. The deterioration percentage was slight. The psychological tests showed depression as the predominant element. The prognosis was good. The recommended treatment was EST [illegible] t were in the [illegible] The A group [illegible] three days in [illegible] veries. One followed the recommended treatment and used eight EST. Two used insulin shock and [illegible] Three patients made [illegible] therapy and psychothe[illegible] patient did not improv[illegible] The one patient seen in [illegible] therapy and made an [illegible] the C stage averaged 66 years of age and spent an average of forty-four days in the hospital. Four of them made occupational recoveries. Two used the recommended treatment and averaged eight EST and two used psychotherapy. There were three social remissions and two failures on using insulin shock and psychotherapy and one failure on using psychotherapy alone. The occupational recovery rate of 47 per cent. is highly unsatisfactory. An equal number of similar situations before age 60 would have had an occupational recovery rate of nearly 100 per cent. These oldsters whose illness was initiated by real adversity had a poorer prognosis than the depressed geriatric [illegible]

The three pat[illegible] opaths averaged 64 years c[illegible] Their I.Q.'s averaged 10[illegible] They averaged twenty-seven days in the hospital. The psychological tests showed the predominance of depression and schizoid trends plus a marked psychopathic deviate element. The prognosis was

poor. EST, insulin shock, and psychotherapy were recommended. They all used insulin shock and psychotherapy and all failed to improve.

The patient with chronic schizophrenia was 65 years of age and spent 332 days in the hospital. Her I.Q. was 98. The prognosis was poor. She used forty-five EST, ten months of insulin shock and psychotherapy, and did not improve.

It is of interest to see how our older patients, as a group, measured up intellectually. It was not possible to administer the Wechsler-Bellevue to all patients but a sufficiently large group (Table I) was tested to make these figures reasonably representative of the entire group. The figures in Table I indicate that this group was average in intelligence. This test was administered at the time the patient entered the hospital. The test scores probably err in the direction of being too low.

TABLE I

RANGES AND MEANS OF WECHSLER-BELLEVUE I.Q.'s

	Number of Cases.	Range of I.Q.'s.	Mean I.Q.
Verbal scale I.Q.	115	60 to 127	94·7
Performance scale I.Q.	98	62 to 134	95·1
Full scale I.Q.	98	61 to 133	97·8

One of the purposes of the MMPI and Rorschach tests was to measure the patients' progress. It is interesting to see what test results obtained at the beginning and at the end of the hospitalisation reveal. Such an approach which disregards diagnosis, duration, severity, and character of symptoms and length and type of treatment admittedly obscures many important relationships, but we thought that such treatment of our data, crude though it may be, would be of sufficient value to warrant the effort. The Rorschach results and the MMPI findings tend to parallel. The Rorschach findings of improvement tend to lag. The MMPI results lend themselves better to serial study for statistical purposes than the Rorschach results. Eighty-three MMPI scores obtained at the beginning and fifty-seven scores obtained at the end of the treatment period served as the basis for this study. These statistics are shown in Table II. The number of cases studied is large enough to be taken as fairly representative of the group as a whole.

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(intere [illegible]
the pc [illegible]
These [illegible]

evidence of the validity of our figures, in that there is no reason for assuming that the therapy used should bring about any particular changes in those areas of personality that are measured by the Mf and Ma scales. A rationale for the modification of symptoms in the other seven areas (Table II) by treatment can be provided, but

TABLE II

COMPARISON OF MMPI SCORES OBTAINED AT THE BEGINNING AND END OF THE TREATMENT PERIOD

MMPI Categories.	Initial Mean Score, $N=83$	Final Mean Score, $N=57$	Difference between Means.	SE Differential.	Critical Ratio.
Hs .	66 5	56 8	9 7	2·1	4 62
D	75 7	64 58	11·12	2·3	4 83
Hy .	65 98	57 3	8 68	1 89	4·59
Pd .	61 05	53·66	7 39	1·67	4·43
Mf .	57 76	55·99	1 77	1·4	1·26
Pa .	64 5	54·25	10 25	1·84	5 57
Pt .	68 20	57·16	11·04	2 03	5·44
Sc	66·4	56·2	10 20	2·09	4 88
Ma	52 62	50 17	2·45	1·83	1·33

the occurrence of sizable gains on the Mf and Ma scales would have been hard to account for. Our initial impulse was to omit any consideration of Mf and Ma scores, but we decided to include *these figures as an indirect test of validity and the results would* appear to confirm the soundness of our statistical approach.

The relative magnitude of the gains on the different scales is in approximately the order that would normally be expected in a group of this type. The greatest improvement is shown on the depression scale, probably because these symptoms are common in the geriatric patients and also because the overall therapy results
[illegible] results of the
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be accounted for largely by the fact that there is a high cor[illegible] ion
between the D and Pt scales. The Pt scale seems to be a secondary
[illegible] factors that account for improvement on the
[illegible] Pt symptoms.
[illegible] Pa scale were
[illegible] er significant
outcome of our research. It is true, of course, that the initial mean
[illegible] his scale is generally
[illegible] t this finding would
[illegible] s a rule we did not

consider stopping EST or insulin shock until the scores were 75 or lower. Usually there wasn't enough insight to start psychotherapy until the scores were 70 or lower. The clinical findings usually paralleled the psychological test results. At times confusion caused bizarre psychological findings, indicating the patient was worse while actually showing clinical improvement. Infrequently the psychological findings were normal, although clinically the patient was very ill. The Rorschach test is most likely to reveal the latter error, and to uncover subclinical or persisting personality or emotional faults.

SUMMARY

Seven hundred psychological tests were made on 141 geriatric patients previously diagnosed as senile dementia. The test results were used as guides to the prognosis and treatments. The psychological findings showed low I.Q.'s, marked deterioration, and confusion in the true senile dementias. The I.Q.'s of the remainder were normal and the deterioration was usually negligible. The MMPI and Rorschach findings were divided into depression and schizoid trends and treatment advised according to whether these trends were pure or combined. The influence of coexisting organic [illegible]

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trend had [illegible]
had a poo [illegible]
depression trend complicated by real and persisting life problems whose results were less than fair. The occupational recovery of eighty-five of 141 patients in this study warrants continuation of this type of research.

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GINZBERG, R., Tomah, Wisconsin. *Psychiatric and psychological techniques in the treatment and management of elderly psychotics.*

RIGIDITY, stubbornness, childishness, confusion, and similar characteristics are considered classical symptoms in an ageing individual. Some observers believe that these symptoms are typical for any elderly individual, hence constituting symptoms resulting from the process of ageing. Other observers ascribe these manifestations to psychotic processes, thus using these symptoms in making a

[illegible] ently, try to make [illegible] of the motivation

The widespread belief is that there is little or no room for such an individual's participation in decisions regarding his needs. An elderly psychotic is therefore managed rather than guided. He is expected to comply with arrangements that are thought to be expedient for him. If he baulks and shows resistance—and he does so in the overwhelming majority of such situations—he is considered to be unsocial and the blame is all his.

Once all the symptoms are established, they are usually classified as irreversible. We inherited this philosophy from the past and continue to carry on this tradition. An atmosphere of finality surrounds an elderly psychotic. His mental status is easily described as " deterioration " and the underlying patho-physiological processes as " degeneration." Neither optimism, nor hope, nor interest can be expected under such circumstances. Thus, humanitarian aspects replace the psychiatric, and physical care becomes the main concern of the psychiatrist.

It is true that psychoses that occur in advanced life are organic psychoses *par excellence*. However, evidence is accumulating that organic changes themselves cannot be considered the only cause of a mental disease. But even if the theory will be accepted that the primary or main cause of the geriatric psychoses is organic, this [illegible] the psychotic behaviour results from interaction of the organically damaged personality with his environment, adding to the total [illegible] nts which are both [illegible] to a wide range of further psychiatric and psychological analysis, and stimulates an approach which differs very much from the traditional finality and hopelessness. Of course, we have to deal with a variety of somatic conditions which should and could be remedied. Vitamin, hormonal, nutritional, and other deficiencies have to be taken into account and treated. In some cases we may achieve remarkable results, but more often we will succeed in improving the elderly psychotic's physical condition while his mental status remains practically unchanged.

One of the first and most important psychiatric problems is how to establish contact with the elderly psychotic. The principal means of communication is verbalisation. However, difficulties in verbalisation are far greater problems among elderly psychotics than in any other age group. Those who suffer from after-effects of cerebrovascular accidents are certainly not the only ones who have this handicap. The so-called senile and presenile dementias, arrested cases of general paresis, Parkinsonian syndromes, advanced cases of demyelising processes, and others constitute a reservoir of these

disturbances. It is astonishing to observe how [illegible]

[illegible]

desperation. Particularly tragical is the situation for paraphasic patients and for those who have difficulties in word-finding. These difficulties are often interpreted as symptoms of the patient's mental deterioration. Actually, these psychotic, or more often non-psychotic or mildly psychotic, individuals are more aware of their speech defects than is realised. Often, when they cannot adequately verbalise their needs, their frustration and disappointment culminates in a tirade of accusations and cursing, which suggests a poorly motivated psychotic reaction. In reality this outburst of temper is motivated by his awareness of his defect and his dissatisfaction with himself and his environment, and can, if recognised, be resolved psychotherapeutically.

The awareness of his own defects as expressed in speech difficulties is not an isolated symptom in the psychopathology of the elderly psychotic. This can be found, for instance, also in disturbances related to perception. An elderly psychotic can be aware of his memory defects, of his impairment of orientation, and can regain insight into his hallucinatory experiences after the episode is over. These disturbances lead, however, to disorientation or partial disorientation or uncertainties in his personality concept, his body image, his relationship to other persons and objects. As a [illegible]
fo [illegible]
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may culminate in panic.

This anxiety or panic is responsible for the most dramatic psychotic manifestations, and is particularly obvious in comparatively fresh cases with recent developments. The puzzled and frightened patient is seeking for help, but does not get it from his surroundings. Instead of help he encounters desperation, instead of clarification he finds bewilderment, and instead of ease he is thrown into an increased state of tension. It should not be surprising, therefore, that the patient denies co-operation, or that his attitude is deeply unsocial, making life intolerable for both him and his environment.

The [illegible]
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experiences with the outside world.

However, he continues to make attempts to adapt to newly created conditions. These attempts are not seldom bizarre and

often misinterpreted. If an elderly psychotic urinates into a radiator instead of into his trousers, it is not necessarily an anti-social act; it could be a move toward a new adjustment. To understand this, we must approach this act psychologically. However, it is usually considered an act of maladaptation, which is only true from the standpoint of the family or of an ambitious hospital management, but not from the patient's angle.

No doubt in geriatric psychiatry we have to deal with manifestations which are by no means uniform. The existing diagnostic nomenclature is of little or no help in determining the actual mental status of the patient. Whether the patient is diagnosed as senile dementia, arteriosclerosis, or general paresis, in the majority of cases, in the initial stages of establishing contact, he is hardly accessible through reasoning, persuasion, or appeal to wisdom. Intellectual channels of communication are, as a rule, blocked by a wall erected between the patient and his environment. The wall is predominantly of emotional origin and is part of the elderly psychotic's defence mechanisms toward an environment which does not show understanding of either his needs or of the difficulties with which he is faced. In order to penetrate this wall, not intellectual but emotional [illegible] not logical but psychological methods, have to be used. [illegible] to most elderly psychotics, and have [illegible] contact with them.

First, the [illegible] the reaction of the environment to him. He [illegible] domineering, overprotective, and even an indifferent attitude. He wants to be taken seriously even when his talk is incoherent, his stream of thought confused, and his behaviour very peculiar. However, an isolated friendly action does not change the patient's negative or unsocial behaviour; in order to achieve results, an atmosphere of acceptance has to be continuously maintained.

Secondly, the patient has to be given maximum possible freedom of action, even though his action appears to be senseless and his goals not understandable. He should not be forced to eat a meal he refuses, no compulsion should be used if he sometimes rejects medication, wandering or other psychomotor hyperactivity should not be forcibly restrained. Although these non-compulsory methods may give rise to some other problems, in their final effect they create a climate that facilitates co-operation rather than opposition, adaptation rather than conflict.

In the third place, an elderly psychotic, if he is not well enough known to the psychiatrist or hospital personnel, should rarely be faced with alternatives. Often the patient is not quite aware of the content of the question, but feels that he has to answer and that the answer might not be adequate. This is sufficient to induce a wave of restlessness.

And lastly, no outburst of temper, no hostile reaction, no aggressive act occurs without some external cause. As in everyone's life, so in the life of an elderly psychotic the so-called minor things

count. Not that these minor things *per se* are the only cause of the patient's rage, excitement, or resentment, but they serve as trigger mechanisms. It is not then surprising how often a quasi-hopeless situation with violent or noisy reactions can be traced to very trivial causes, such as an unfamiliar shirt, a disliked breakfast, an unaccustomed chair, a new brand of toiler paper. It is not only the toilet paper, it is that it symbolises neglect, rejection, or at least indifference to him as a person.

To facilitate communication, it must be demonstrated to him by deeds that he is accepted as he is, that he is not pushed around, that his habits are taken into consideration, that his difficulties, if not entirely understood, are at least taken seriously, that decisions are not forced upon him, that he is regarded as a personality and not as an object of management.

This can primarily be achieved by attitude therapy, by an atmosphere of acceptance which is created on the ward and in the entire hospital. The personnel, as well as doctors and nurses, must have enough time to learn to listen to the patient with thoughtful consideration, observe his actions, know his habits, and try to understand the language or meaning of the elderly psychotic's behaviour, and not to treat him with sentimental neglect, patting on his shoulder, or giving him fair words that neither he nor anyone else believes.

In extreme cases of deterioration the tone and general attitude of the environment, rather than the content of talk, are of primary importance. If the attitude of the patient changes, and/or if we have to deal with a less damaged individual, the atmosphere of acceptance is used as a vehicle for further therapeutic attempts.

Should a geriatric psychiatrist not have experienced personnel available, he has to train them. The personnel are an important part of the treatment team, and must wholeheartedly accept the basic principles of the attitude therapy advocated here, otherwise the whole programme might be jeopardised.

CONCLUSION

Although no mention has been made of somatic treatment, it should be stressed here that somatic and psychiatric treatment are regarded as two parts of one entity. The psychiatric approach is [illegible] geriatric [illegible] This [illegible]. The [illegible] n and can be used to rebuild the damaged but not destroyed personality. It is our task to help him to use the preserved faculties for adaptation to an adequate environment.

Adaptation by an elderly psychotic is not a unilateral process. Mutual adjustment—that of the patient to his environment and of the immediate environment to the patient's needs—is the method of choice in the approach to aged individuals. The attitude therapy

is based on a psychological adjustment of the environment to the elderly psychotic's difficulties.

DISCUSSION

In reply to a question from Miss H. M. KEYNES (London), who asked about methods of training elderly psychotic patients, Dr GINZBERG said: "The most important thing is that we should understand why the patient refuses to eat or why he is in opposition to his environment. My staff are trained not to report that a particular patient is noisy or restless but to report to me why, in their opinion, he behaves so. We have to try to find out the motives for their behaviour. Certainly it is a combination of psychological and physical symptoms. I think there is no action without motivation and, therefore, if you succeed in diverting the patient from his own problems it may make him better but it will not solve the problem. Therefore, I believe that we have first to listen to the patient, observe him if he cannot express himself sufficiently well, and try to understand the meaning of his behaviour."

Dr F. POST (U.K.) asked what criteria Dr Ginzberg used for the selection of patients for group psychotherapy.

Dr GINSBERG: "This group therapy was done on a highly experimental basis. We had no experience in other fields and so we decided to have a group of patients for psychotherapy. I think we [illegible] of our patients reacted with restlessness in the group. As a rule we used the non-directive method of group therapy. Then we decided to take out these paranoid patients and we have a group of paranoid patients on an experimental basis. Our first attempt failed. However, we now have another group of paranoid patients and the experiment has been going on for three months with some hope of getting results. I have a group of thirty patients—sometimes thirty to forty patients, not because I like to have so many but no other psychologist will help me—and I have had them for a year, and I must say that it helps enormously in restoring a feeling of personality. We do not go too deeply into the problems, but we solve some surface problems which relieves several of our patients from [illegible]

"[illegible] the patients to feel that they are personalities. If you like to put [illegible] rapy, but the patients [illegible] problems as well as [illegible] the hospital, and to be open in their approach. That helps us to understand the patients better. If we see that a patient is responding we shift him to individual therapy.

"With regard to results, 10 per cent. of our patients are released. Although we do not use any [illegible] and we treat acute diseases. [illegible] 300 who had been locked u[illegible] our patients are chronically ill. Fifty per cent. of our patients are moving about the grounds, although they have many memory defects and other phenomena. Sometimes they get lost! Eighty [illegible]

[illegible] who had spent thirty-one years in hospital. He was a diabetic and was diagn[illegible] doses of i[illegible] all right. [illegible] himself. That, I know, is only one case, but it is not an isolated one."

HOFF, Professor H., and TSCHABITSCHER, H., Vienna. *Prophylaxis and treatment of psychoses in the aged.*

RESEARCH into the psychiatric and psychological problems of old age appears to be entering a new phase. During the nineteenth [illegible] microscopy o[illegible] this period.

In 1915 [illegible] means emotionally [illegible] accord with the extent of their short memories. After World War I, De Monch, and later Gilarowsky, mentioned that certain experience factors, a product of the times, might be one cause of the increase in psychic senile disturbances during the post-war period. In 1928 Biese described the "pattern of experience in old age," and since then similar statements recur in the literature, for example, by Stern and Runge in "Bumke's Handbook."

In recent years—probably in connection with the new vitality of the mental hygiene movement—our attention has been attracted [illegible] yd, jun., [illegible] certain [illegible] ong the aged. These symptoms include pronounced conservatism, pro[illegible] memory for long-ago events. One can also observe a lessening of

concentration and, finally, a pronounced tiredness, causing the slow-down of all psychic activity.

On the basis of this aged personality, psychoses can be developed in a definite relationship. They are :—

1. Korsakow-like states.
2. Conditions of melancholia and hypochondria.
3. Manic states.
4. Paranoid states.
5. A trivial condition which we call the delirium state.

These senile psychoses have a well-known correlation. Macroscopically they involve a weight loss of the brain, a deepening of the gyri and sulci, with occasionally considerable hydrocephalus internus and externus and a chronic leptomeningitis.

In some cases sclerosis of the brain is more obvious. This may alter the large or small vessels of the brain, frequently causing psychic changes. Psychoses developed in this way are similar to those found in senile dementia, except that in senile dementia the symptoms are "lacunar," certain regions not being affected by the dementia. In these cases the patients can still function normally in some ways. Generally this organic dementia is combined with increased emotions.

Sometimes such psychoses are very slow in starting, at other times they appear suddenly. It cannot be imagined, however, that brain alterations can occur which make a man, healthy a few hours before, into a victim of senile dementia. It is assumed that in such cases some function of the brain which had been working relatively well suddenly broke down. This breakdown may be caused by physical or psychic symptoms. We call it cerebral decompensation. Schindler calls cerebral decompensation that state during which [illegible]; leading [illegible] akdown [illegible] used by either psychic or physical factors.

Among the psychic factors are, first of all, disturbances in the family balance. An old man who loses his life's partner may never again be capable of maintaining ordinary human relationships. A second cause may be a change of abode; third, alterations in routine activity; or fourth, external events such as loss of property or family quarrels, may be involved.

Physical disturbances may also play an important role at the start of senile psychoses. Operations, especially when followed by a stay in hospital, can be noted in this connection, and in such cases psychic and physical symptoms are combined. Those operations requiring later isolation from the outside world, such as confinement in a darkened room after the removal of cataracts, are especially conducive to psychic disturbances. Permanent alteration of the brain through alcohol or nicotine are other pre-conditions for the outbreak of such psychoses. First of all, there will be disturbances

in the vascular apparatus of the brain. These could, again, be caused by external factors or from within the brain itself. We will find in some heart conditions not only an anoxia of the brain, but also a constriction and later dilation of the vessels, often leading to a state wherein some vessels remain constricted while others are dilated. This state is often combined with delirious confusion. In such cases we speak of a vascular decompensation. It can be accompanied by a small apoplectic stroke. We must assume that an organic system which was intact just previous to the event was decompensated by the stroke.

Vascular decompensation may frequently lead from this delirious state to another psychosis. Schindler was correct when he mentioned that the factor causing the disease does not determine the psychosis. He showed that constitutional psychic and physical factors also play a role. Such constitutional components can release endogenous factors.

In conclusion, it can be stated that the following factors play their parts in the outbreak of a senile psychosis:—

1. The general condition of the brain, its cells, its basic substance, and its vessels,
2. The constitutional factor of the personality, the attitude of the respective individual toward the problem of growing old, and the youth who is taking his place,
3. The localised factor of the alteration of the brain,
4. The factor causing the disease, always of specific importance.

Having described the outbreak of psychoses of the aged, we now turn to their treatment and prophylaxis.

We can readily understand that such treatment is possible, since we gave such importance to the factor causing the disease and its exogenous components. We saw that melancholic phases can be treated with electro-shock with greater success in the aged than with younger persons suffering from manic-depressive conditions. [illegible] of senile dementia [illegible] vidual's concentration on emotions about and interest in the outside world. These factors are accentuated during the psychosis. The person with senile dementia is not demented because of malfunction of his brain. Many things about him which appear demented are merely the result of his lack of interest in present and future which do not seem to offer him much. It is obvious that such tendencies are accentuated by an endogenous psychosis. By getting rid of the psychosis it is possible also to remove the signs of senile dementia.

It is true that senile dementia is one of the organic psychoses, [illegible]

With adequate organic treatment we can effect improvement in this disease. Therefore it is necessary to decide whether we are facing a vascular or a cerebral decompensation, or if in a particular case the vascular or psychic component is of greater importance. Investigations by Kety into the blood circulation of the brain decided this matter. The method has many faults, however, and results must be considered with caution.

At our clinic, examinations of cerebral blood circulation after Kety's method are made on patients suffering from vascular cerebral decompensation. At the same time we add to this diagnostic examination a pharmacological examination by administering 1 to 2 ampoules of a vascular dilating drug, hydergin, for example, to the patient after the "Leerversuch." The blood circulation test described above is then repeated, and from the results of the Leerversuch and the Belastungsversuch with drug we can state the objective effect of the drug on cerebral blood circulation. We could see that hydergin improves cerebral blood circulation without considerably lowering blood-pressure. The average of the blood-pressure sets is between 10 and 20 mm. of mercury.

It seems of great importance that the blood-pressure is not unduly lowered when administering hydergin, for a lowering of pressure would mean in turn poorer circulation and would therefore not permit vascular dilation. A short time ago we started hydergin infusion therapy in patients with vascular cerebral decompensation. Each receives an infusion of 500 c.cm. 5 per cent. dextrose, together with 2 ampoules hydergin, within a period of two hours. We have the impression that in approximately half of the cases this hydergin infusion has favourable effects and helps to improve the patient's confused state. We must mention, however, that a hydergin infusion does not have permanent effect. It is necessary to apply this relatively simple method twice or three times a week. We dare to say that hydergin infusion therapy shows good results with some vascular decompensation patients. Further investigations with regard to cerebral blood circulation disturbances by aid of the Kety method and the pharmacological effect of various drugs on cerebral blood circulation disturbances of the aged are still continuing.

We have tried to give you a short survey of the various factors causing senile psychoses which we believe to be important. Only knowledge of these factors will permit us to begin suitable prophylaxis and treatment through consideration of such factors, and the treatment will vary from individual to individual.

HIMLER, L. E., Michigan. *Factors influencing prognosis in psychiatric illness of the aged.*

THIS report is based on a follow-up study of 200 patients over 60 years of age who were hospitalised in a private psychiatric sanatorium

during the years of 1950 to 1952. The subsequent course of these patients in terms of clinical progress and social adjustment was followed for a two-year period. All available information was analysed with a view toward correlating the medical, psychological, sociological, and psychiatric data with later outcomes, whether favourable or unfavourable.

The patients in this series are drawn from the populous urban and rural area of south-eastern Michigan, and are typically upper middle-class people from a wide variety of social, vocational, and religious backgrounds. One negro is included in the group. These individuals are representative of the type of elderly patients who [illegible]

psychiatric hospitalisation is sought, often on an emergency basis, with the hope of returning the patient home if rehabilitation is possible, or for assistance in a programme of care if long-range placement will be required.

Classification of outcomes. The crucial issue in the outcome of

Group I—Patients who continue much improved or recovered, whose relatives confirm the report that they are capable of managing their own affairs as well or better than before, and who are occupied in some part-time or full-time work, have interests in some avocation, and take part in social activities of their community.

Group II—Patients who are improved and able to live at home, but who require special attention for minor or non-disabling infirmities or defects of physical, mental, or emotional nature, which interfere to a considerable extent with the full range of activities mentioned in Group I.

Group III—Individuals who have major disabilities or defects in their mental and emotional health, with or without accompanying physical or neurological disability, such that they require considerable supervision and care in order to maintain a minimal adjustment in their own home or in some private nursing or convalescent institution.

Group IV—Unimproved patients who are totally unable to manage for themselves and who require constant custodial type of supervision, either in a suitable nursing home or in a state mental hospital. Irreversible, progressive, degenerative dementias are included in this group.

Some fifteen factors related to pre-morbid personality, the apparent precipitating cause of the mental illness, the treatment used,

and the quality of after-care were evaluated at the end of the two-year observation period. The factors selected for presentation here are those which permitted some type of objective measurement. Data from the hospital record were pooled with all information available to the psychiatrist and the psychiatric social worker, as gained by continuing contacts with the patients and their families up to the present time.

Age and sex differences—The study group consists of eighty-two males (41 per cent.) and 118 females (59 per cent.). The age range is from 60 to 93, the average being 66 years 4 months, and the mean 65 years. As shown in Table I, 71·5 per cent. were between 60 and 70 at time of admission to the hospital, and the remaining 28·5 per cent. were over 70.

TABLE I

Age Range	Males	Females.	Total.	Per Cent.
60 to 64 years	38	55	93	46·5
65 to 69 years	18	32	50	25.0
70 to 74 years	13	23	36	18 0
75 to 79 years	4	3	7	3·5
80 years and over	9	5	14	7 0
Total	82	118	200	100 0

Fifty-one per cent. of the patients with a favourable outcome (Groups I and II) were below the age of 65 when admitted, and 44·4 per cent. were between 65 and 75, after which the favourable outcomes drop to 4·7 per cent. Of the unfavourable outcomes, 41·5 per cent. were below 65 at time of admission, 41·4 per cent. were between 65 and 75, and 17·1 per cent. were admitted after 75.

For the group as a whole, 106 (53 per cent.) had favourable outcomes, and ninety-four (47 per cent.) had unfavourable outcomes. Thirty-four (41·4 per cent.) of the eighty-two males in the group had a favourable outcome, and in forty-eight (58·6 per cent.) the outcome was unfavourable. Similarly, of 118 females in the total series, seventy-two (61 per cent.) had favourable outcomes and forty-six (39 per cent.) had unfavourable outcomes. Comparison reveals that female patients have a consistently better prognosis in all age ranges.

Outcomes in relation to diagnosis—Of the ten diagnostic groups shown in Table II, senile and arteriosclerotic psychoses make up 27 per cent. Functional and affective disorders (involutional psychoses, manic-depressive psychoses, depressive reactions, and other psychoneuroses) make up 66 per cent. The remaining 7 per cent. consists of toxic and organic disorders, and four cases of schizophrenia.

Senile and arteriosclerotic cases grouped together had favourable outcomes in only 6 per cent., as contrasted to 44·5 per cent. in the

involutional - affective - psychoneurotic group. Manic - depressive cases presented some difficulty in final classification, three having had recurrences during the observation period, but on an overall basis twelve were considered favourable and sixteen unfavourable in terms of clinical outcome. The higher number of unfavourable outcomes in the affective group than might be expected is undoubtedly

TABLE II

OUTCOMES

Diagnosis.	Favourable	Unfavourable.	Total.	Per Cent.
Senile psychosis	1	17	18	9·0
Cerebral arteriosclerosis	11	25	36	18·0
Involutional psychosis	36	19	55	27·5
Manic-depressive psychosis	12	16	28	14·0
Depressive reactions	35	6	41	20·5
Psychoneurosis	6	2	8	4·0
Alcoholic psychosis	4	1	5	2·5
General paresis	0	3	3	1·5
Organic psychosis	1	1	2	1·0
Schizophrenia	0	4	4	2·0
Total	106	94	200	100·0

influenced by superimposed arteriosclerotic features which overshadow the original recurrent functional disorder.

Personality factors—Background information in the case histories reveals that 81·5 per cent. of the patients in this series had made satisfactory social adjustments, and 92 per cent. had made good vocational adjustments before hospitalisation. There is evidence that major family and marital problems had occurred during the lifetime of some 35 per cent. Patients in this group are evenly divided between the favourable and the unfavourable eventual outcomes, and there is no difference between the sexes in relation to this factor.

Examination of the marital status reveals that 55·5 per cent. of the entire group were married, 29·5 per cent. were widowed or divorced, and 15 per cent. had never married. It was found that of thirty patients who never had children, twenty-one were married, eight were widowed, and one was divorced. When the thirty single patients (five men and twenty-five women) are added to this number, it appears that sixty or 33·3 per cent. of the total group never experienced parenthood. This stands in contrast to the estimate of sociologists that for the population as a whole the number of individuals who never experience parenthood is not above 19 per cent. at the highest. In spite of its high incidence in this group of hospitalised patients, childlessness as such, however, does not predominantly in the unfavourable outcomes. There is

and the quality of after-care were evaluated at the end of the two-year observation period. The factors selected for presentation here are those which permitted some type of objective measurement. Data from the hospital record were pooled with all information available to the psychiatrist and the psychiatric social worker, as gained by continuing contacts with the patients and their families up to the present time.

Age and sex differences—The study group consists of eighty-two males (41 per cent.) and 118 females (59 per cent.). The age range is from 60 to 93, the average being 66 years 4 months, and the mean 65 years. As shown in Table I, 71·5 per cent. were between 60 and 70 at time of admission to the hospital, and the remaining 28·5 per cent. were over 70.

TABLE I

Age Range	Males.	Females.	Total.	Per Cent.
60 to 64 years .	38	55	93	46·5
65 to 69 years	18	32	50	25.0
70 to 74 years	13	23	36	18·0
75 to 79 years .	4	3	7	3·5
80 years and over	9	5	14	7·0
Total .	82	118	200	100 0

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Economic insecurity was a factor in 18 per cent. of the total cases, evenly divided between males and females, and between favourable

, treatment of the
. nursing personnel
regular routine of
daily habits and activities. Along with improvement of nutrition and treatment of the general physical condition, success in establishing such improved adjustment habits is often of determining

hospital commitment, which far too often is the only alternative when the family resources are exhausted.

Besides its specific value in depressive disorders, electrotherapy is often definitely helpful in controlling disturbed states and food refusal when patients are first admitted to the hospital. This form of treatment was employed in 148 (78·5 per cent.) of this series. Of these, eighty-nine (60·1 per cent.) had favourable outcomes. Equal numbers of both improved and unimproved senile and arterio-

59·4 per cent. of these were in the favourable and 32 per cent. were in the unfavourable categories. It is estimated that in some 71·5 per cent. of cases relatives were able to gain better understanding of the patient's illness and needs with respect to care after discharge from the hospital.

Outcomes at end of two-year period—Follow-up information

or part-time work. Eighty-two per cent. regarded their general physical health as satisfactory. Hobbies of some kind were mentioned by 72·2 per cent., and 90·5 per cent. indicated continuing interest in social and community activities. This convincingly reaffirms the fact that the universal need for satisfying personal, social, and emotional experiences applies no less to the recovered mentally ill than to all individuals in the sixth to eighth decades.

On the unfavourable side, fifteen men and sixteen women were committed to state hospitals during the two-year study period, constituting 15·5 per cent. of the original series. The balance of the sixty-five patients in the Group IV unfavourable category have

required custodial care in various private institutions and nursing homes.

[illegible] cent. of the female patients. The survival time of these forty-four patients ranged from less than one month to thirty-six months, the [illegible] hospital. Twenty- [illegible] is and cerebral [illegible] nal number.

Suicide occurred in three men and one woman, two in the manic-depressive, and two in the depressive reaction categories. The average age at death for these four patients was 64 years.

BATCHELOR, I. R. C., Edinburgh. *The management and prognosis of suicidal attempts in old age.*

A CASE history was quoted to illustrate briefly the typical clinical features of suicidal attempts made by people aged 60 years or over: the vulnerability of the previous personality, the usual setting of a severe depressive reaction, the influence of physical disease, and the particular importance of feelings of loneliness and uselessness.

The practical management of these situations, which are often medical emergencies, was described. It was stressed that in each case a comprehensive review must be made of the ætiological factors and the social setting, and that the psychiatrist, the physician (internist), and the psychiatric social worker should collaborate in this. The estimation of the seriousness of these attempts, the value of initial admission to an observation ward in a general hospital, the indications for mental hospital or other institutional care, and the scope of treatment were discussed.

Forty consecutive cases of attempted suicide in old age, the clinical details of which have already been published, were followed over a period of two to three years after their suicidal attempts. The leading findings were that at least 80 per cent. of those who attempted suicide in old age were suffering from depressions, and of these nearly two-thirds recovered. Twenty per cent. of the depressives who recovered had recurrences, and a further 15 per cent. died within two years. Among those in this age group who attempted suicide, 10 per cent. completed the act within two years. The subsequent suicidal risk was therefore greater than at earlier ages, and any relapse into depression must be treated urgently and with full recognition of this very serious suicidal risk.

DISCUSSION

Dr T. S. WILSON (Truro): "Can you say how frequently you find the classical delusionary ideas of the depressive rather than just a moody depression and preoccupation with loneliness?"

Dr BATCHELOR: "About three-quarters are suffering from clear-cut depressive psychosis."

Mother M. BERNADETTE (New York): "What should be done with a person who has been acting suicide and one is not sure whether real suicide is intended?"

Dr BATCHELOR: "Any person over the age of 60 who speaks of suicide should have the threat taken seriously. In contrast to younger people, talk of suicide in an old person is a serious indication of a suicidal trend."

CHAPTER XII

CARDIOVASCULAR DISEASES

HARTROFT, W. S., Toronto. *The premature ageing of the cardiovascular system produced in young rats by dietary choline deficiency.*

Old Wistar rats, 600 days of age or more, spontaneously develop degenerative lesions in their aortas and coronary arteries as reported some years ago by Wessler and others, and as we have since confirmed in our own colony. A few years ago in the Banting and Best Department of Medical Research at the University of Toronto, my associates—Professor Charles H. Best, Dr E. A. Sellers, and Dr Jessie [illegible]
would de[illegible]
period of [illegible]
lipotropic [illegible]
of choline and its precursors (betaine, methionine) that prevent [illegible]

experiments in these instances need only be three to five weeks.

A series of colour transparencies were shown demonstrating the lesions in aortas, coronary arteries, myocardium, and renal glomeruli of the deficient rats. Because the pathologic changes resemble, in an extreme form, lesions that sometimes develop " spontaneously " in their old age, we have dared to describe them as " premature ageing " in young rats produced by lack of adequate amounts of lipotropic dietary factors.

Reference was briefly made about some of the accessory factors studied in relation to choline deficiency-induced vascular lesions in rats; these findings will be published soon in a series of papers now in preparation.

Firstly, varying the level of α-tocopherol in the diet did not influence the course of the vascular changes. These experiments were conducted with the help of Dr Robert Young in the Banting and Best Department of Medical Research.

Secondly, Dr R. Young and I found also that betaine protects young rats against this type of vascular damage as effectively as does choline.

Thirdly, with Dr G. Buckley in the same Department, it was found that excessive doses of vitamin D intensified the vascular changes, but only in the absence of adequate amounts of dietary choline. Choline supplements afforded almost complete protection to rats against the harmful effects of hypervitaminosis D (15,000 to 20,000 international units per day per rat) on their cardiovascular and renal systems.

Fourthly, choline supplements did not protect rats 400 to 500 days old against the " spontaneous " development of coronary lipoidosis.

Fifthly, to date, a variety of surgical manipulations to produce renal insufficiency did not aggravate cardiovascular lesions in choline-deficient rats. Dr George Wilgram in our department is currently pursuing this line of investigation further.

Sixthly, restricting the caloric intake of young choline-deficient rats affords them a measure of protection against vascular damage, as shown by Mr Henry Best and Mr J. Blumenstein in our department.

We should emphasise that our choline-deficient rats did not receive any supplements of cholesterol in their diet; indeed, the serum cholesterol levels of the animals in the choline-deficient groups in which lesions developed were lower than in healthy, *choline-supplemented controls.*

In conclusion, our findings at present have no direct relation to cardiovascular disease in man. We believe the experiments are of interest because they offer a means of producing experimental cardiovascular lesions in young rats within very brief periods by a *dietary deficiency alone. And further, the data suggest that dietary* lipotropic factors in adequate amounts may constitute yet another set of conditions that may play an important role in maintaining the health of not only livers and kidneys, but also hearts and arteries of experimental animals and possibly man.

DISCUSSION

Dr A. J. CARLSON: " How did this affect the life span of animals? Have you any data on that which would indicate it specifically?"

Professor HARTROFT: " Rats and mice will live on a low-choline diet for up to twelve to fifteen months, which is much less than a rat's normal life span. In the end they die of cirrhosis of the liver or they die of chronic renal disease."

Professor ALBERTINI: " Could Dr Hartroft tell us something of the course that predilection runs in connection with these rats?"

Professor HARTROFT: " The incidence of lesions is severe in the [illegible] and less advanced as [illegible]

[illegible] pped the low-choline diet immediately after the time when you took the pathological pictures which you have shown?"

Professor HARTROFT: " I expect it would be rather difficult to reverse the process."

FRANKLIN, K. J., London. *The last half-millimetre, or the blood capillaries.*

[illegible] of the Sectional Committee I am to review knowledge [illegible] *it special reference to ageing,* [illegible] of this session. I chose the

title "The last half-millimetre," because many of the capillaries in the body are of approximately this length and it is in them that the blood comes nearest to the tissue cells for the exchange of materials with them, an exchange that is a major function of the blood circulation. To cover the subject properly would take many times the half-hour allotted, so a condensed, selective précis is all that I shall present. To paraphrase what William Harvey wrote in a different connection: "The field is so enormous that, if I explored it fully in all directions, not only would this treatise of mine turn, contrary to my plan, into a full-sized book, but the rest of my life would perhaps not suffice for my writing of it." *

"Harvey made the capillaries a logical necessity" but did not see them; in 1661, four years after Harvey's death, "Malpighi made them a histological fact" (Harris, 1909), but his beginning led to no large-scale developments until the present century—indeed, until about the time of the First World War.† Since then the study of the capillaries has been greatly facilitated by improvements in technique, while the impulse to such study has been increased with a change in orientation of outlook in physiology and allied sciences, which have more and more concerned themselves with the activities of the tissue cells. Concomitantly, the blood circulation has lost its somewhat detached character and has become just one part, even if a very important one, of the total fluid movement within the body (Franklin, 1952). The active heart is still the most spectacular item in the whole circulatory picture, but its activity has been shown to be dictated to it by the venous return. In addition, its output—in the adult human subject about 8,000 litres per day—has been found to be almost equalled by the amount of fluid which passes in the same time through the capillaries to the extravascular spaces. For these various reasons the smallest vessels of the blood vascular system have gained very considerably in status and in interest.

These capillary vessels are essentially endothelial tubes, *i.e.*, for all practical purposes they have only the basic structural element of [illegible] 1951) an old term was "the endo- [illegible] hat concept should make it easy [illegible] t, difficult to produce a definition [illegible] roughout the animal kingdom, [illegible] finition is in any case made on anatomical grounds, though some neighbouring vessels may be

* Harvey, 1628, 63. "... campum invenio spatiosissimum, ubi longius percurrere & latius expatiari adeo possim, ut non solum in volumen excresceret praeter institutum meum, hoc opus. Sed mihi forsan vita ad finem faciendum deficeret."

† The problem of shock—"a state of persisting deficiency of flow, however [illegible]

functionally not dissimilar. Three criteria, I think, serve to limit the structural connotation. These are:—

1. That a capillary is a minute vessel the wall of which is devoid of smooth muscle fibres or of compact collagenous ones.
2. That it does not give rise by subdivision to subsidiary vessels.
3. That it is not produced by a union of subsidiary vessels.

The second and third of these criteria do not exclude vessels of equal status which anastomose or form networks; as Gilding (1951) wrote, it is rare for a capillary to go from arteriole to venule without at least one such union, and very commonly there are many. The second criterion, however, does exclude the distal part of the thoroughfare channel described by Zweifach *et al.* (see below), for from this part, as from the proximal somewhat muscular one, pre-capillaries are given off; pre-capillaries themselves are also excluded. These outcomes need not make the criteria unacceptable; they merely remind us that we must include certain vessels other [illegible] available for exchange of [illegible]

may also play a part. In voluntary muscle, [illegible] fascicular arterioles and venules act so effectively to sustain the tissue about them that where they run no capillaries are supplied" ([illegible] Gilding, and Smith, 1930).

[illegible] skeletal muscle was [illegible] *Cyclopodia* [illegible]

[illegible] vals, so that [illegible] distance between two arterioles is twice the length of a capillary. [illegible] the findings in respect of mammalian [illegible] urinary bladder. [illegible] uctural arrange- [illegible] particular organ [illegible] qual nutritional [illegible] for the individual constituents of more or less

[illegible] uctural pattern involving [illegible] pattern exhibiting modi- [illegible] of permeability gradients [illegible] ent schema of Chambers, [illegible] their findings in various [illegible] to some critics, does not represent the sole, or indeed the most widespread, arrangement even in those tissues.

The unit of the new schema comprises a metarteriole that constitutes the beginning of a thoroughfare channel, pre-capillaries branching off from the channel at rather obtuse angles, "true" capillaries deriving from the pre-capillaries, and post-capillary

interdigital web, scrotum, and mesocæcum (meso-appendix) of the rat; the ear, corneoscleral junction, and mesentery of the rabbit; the mesentery and omentum of the dog, and (?) the same, plus the nictitating membranes, of the cat; finally, the conjunctiva of man. This is an impressive list, but we must note that important organs such as the central nervous system, heart, kidney, etc., have not been amenable to study, and that skeletal muscle has, for technical reasons, been only very imperfectly so. We should not, therefore, accept the [illegible] peripheral [illegible] ıms [illegible] not [illegible] vert [illegible] ɔers and Zweifach, 1944) to keep one's mental picture correct.

It seems to me that there is no particular clash between the findings of Zweifach *et al.* on the one hand and those of Bowman and Todd and of Rous *et al.* on the other. The differences merely mean that we cannot generalise about capillary arrangements, and even that fact need not be counted a hardship if the topical anatomical variations give us indications in respect of the physiological ones. A point of major importance, however, is that the skeletal musculature constitutes about half the body-weight; if the capillary picture is roughly the same throughout this mass, then that picture is the most typical one in the body.

We can now revert to the capillaries proper and, to begin with, to their [illegible] long, *e.g.*, the capi[illegible] ·42 mm. (Brown [illegible] muscles (Rous, C[illegible], with an average of 0·69 mm., have been found. If such variations are not inconsiderable, they are nevertheless completely dwarfed by those in calibres. In inactive tissues many, or even most, of the capillaries may be temporarily occluded and impervious, so the lower limit of internal calibre is, or approaches, zero. Open capillaries in guinea-pig muscles averaged 3·5 μ (abdominal wall) and 5 μ (diaphragm), both figures being much smaller than the width, [illegible] that had to traverse the channels [illegible]

meters exceeding those of the corpuscles, and in man von Hayek (1952, 231) reported that the alveolar vessels were indeed 10 to 12 μ wide; surprisingly, however, the pleural capillaries were up to six times as wide as the alveolar ones. All the above gives us an idea of local and activity variations; we should add another, namely, the

progressive increase in width that can occur from the arterial to the venous end of a single capillary. Gilding (1951) mentioned this ... of the endothelial wall as general ... nstance, namely, ... illary were 11 μ ...

One consequence of the minuteness of the dimensions of capillaries is the large number of these vessels that can be present in a very small amount of tissue. Krogh (1922, 8-9) calculated that, per square millimetre of skeletal muscle, 400 vessels were present in the cod and the frog, 1,300 in the horse, 2,600 in the dog, and even more in the guinea-pig; he also estimated that the total length of the muscle capillaries in an adult man was 100,000 km., or two and a half times the circumference of the world. While this last is interesting, the specific variations in capillary density are far more relevant here, for they suggest a relation to metabolic activity. The ...

nervous system in general, the glands, and muscle ... heart muscle); it is low by contrast in tendons, ligaments, nerves and bones, and practically nil in normal cornea, heart valves, and cartilages. There are, finally, very large capillary surfaces in those organs, *e.g.*, the lungs, liver, kidney, villi, and endocrine glands, where the blood is present less for the organs' own nutrition than for other exchange purposes. ... density ...

and 7,300 sq. cm., and that the muscle capillaries of ... would have a total surface area of 6,300 sq. metres.

These astounding statements, all deriving from the small size of the vessels, may conveniently have added to them here a more functional one, namely, that 1 ml. blood would take one year to pass through one capillary. Finally, I should like to give an idea ... ifying ...

about 1·5 ft. To make an accurate model ... of the microscopic details would be difficult because of gaps in our knowledge of the microscopic details, but let us review those features about which we have some information.

The long axes of the endothelial cells are often more or less parallel to the long axis of the vessel they form, but on occasion they lie more obliquely and one may find a cell passing spirally half-way round the vessel (Benninghoff, 1930). Nor do these exhaust

the possibilities. The lengths of the cells, according to the rather scanty literature, vary from 40 μ or less up to 75 μ and even 175 μ, and their widths from 15 to 83 μ. As to their thickness, the non-nuclear part in moderately open vessels is often 0·85 to 0·9 to 1 μ or slightly over; the figure of 1·5 μ given by one writer is unusually high. The nuclei tend to be "oval" in shape, and are often about 15 μ long and 5 μ wide; their depth exceeds that of the non-nuclear parts of the cells. Very often one cell provides the whole circumference of the endothelial tube, less frequently two do so, comparatively rarely three or even four. The cell membranes are formed (?) of lipoprotein;
solution, with filamentou
chondria evenly dispersed
postulated by some observers in the capillary wall, but remain hypothetical. The intercellular, silver-nitrate-reducing, cement substance, which is formed by the cells in the presence of vitamin C, is soften
by the
lowered
Zweifach, 1947). The width of the cement substance is just on the limit of optical resolution by visible light, which is a little over 0·18 μ, and we can therefore call it 0·2 to 0·4 μ.

Apart from the endothelium and the intercellular cement, the capillary wall consists of an endocapillary lining, which is non-cellular and is possibly derived from circulating blood protein, and a pericapillary sheath (Chambers and Zweifach, 1947). The endothelium, plus the endocapillary lining, normally provides a very smooth surface which facilitates movement of the erythrocytes along it and evokes in them no tendency to adhere. In the pericapillary sheath, with variations according to local conditions, may be macrophage (Rouget) cells, fibroblasts, an argyrophil network, and elastic fibres, constituting (apart from the macrophages) a meshed support that attaches the endothelial tube to surrounding structures and allows it possibilities for limited movement and for variations in calibre. There is ample evidence, according to Gilding (1951), for the presence of a fine plexus of non-medullated nerve fibres around the capillaries, but none for intracytoplasmic nerve endings in the endothelial cells. It is perhaps unnecessary to stress that the microscopic picture given in the above two paragraphs is

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with the exact adjustment of each organ's blood supply to the measure of that organ's ever-varying need of blood. Gollwitzer-Meier added that the function of the capillaries was to adapt the extent of the surface between the blood and tissues to the metabolic needs of the latter, and to provide conditions suitable for these [illegible] function of [illegible] ers [illegible] ies, [illegible] gen requiring a large blood flow but in part imposing [illegible] requirement, for the body as a whole. With regard to the purely [illegible] required as oxygen, water, nut [illegible] he most important sal [illegible] t of it at any given of [illegible] ' In any discussion tim [illegible] mind that its *chief* of *function* is the *delivery of oxygen*. Circulatory dimensions, design, and operations may be correlated best with this function." In accord with this is the fact that the mitochondria in a tissue cell are always situated in that part of it which is nearest to the oxygen supply, *i.e.*, to the capillary serving the cell.

The first special point that will be considered is the functional variation in calibre that is so striking a feature of capillary activity, and which has demanded full use of the powers afforded by light microscopy and by cinematography * for its observation and recording. In 1921, a date chosen because Hooker's review appeared in that year, there were three possible causes of the calibre changes, namely, that they were secondary results of others in the afferent arterial or efferent venous system, that they were due to contraction of peri-endothelial cells, and that the endothelial cells themselves or their nuclei could swell up into and occlude the lumen. With regard to the first of these, dependent contractility and dilatability, which must obviously affect long stretches of vessel, such knowledge as we have about the elastic properties of the endothelial tubes makes acceptable the idea that, *cæteris paribus*, their widths must vary according to the blood pressure inside, and the tissue fluid pressure outside, them. This was styled " passive vasomotion " by Nicoll and Webb (1946) and is exemplified in their observations on the circulation in the bat's w[illegible] since 1921 we have seen [illegible] agents responsible, follo[illegible] that view (but see Beecher, 1936) and the classification of the cells [illegible] long before 1921 [illegible] ervals ever since; [illegible] is always, I think,

* Krogh projected the first cine-record (Krogh and Brandt Rehberg, 1924) to the 11th International Congress of Physiologists at Edinburgh in 1923.

been for the swelling of the nuclei (inwards—the external diameter of the vessel remains virtually unchanged) rather than of the cells as a whole. From the items since 1921 I will mention but two, namely, a chance (unpublished) observation by H. P. Gilding a generation ago,* and the paper by Sanders, Ebert, and Florey (1940), which, with their colour cine-film, provided convincing objective proof that endothelial nuclei can swell up, both spontaneously and as a result of sympathetic nerve stimulation, to occlude temporarily the capillary lumen.†

Apart from such changes in size of endothelial nuclei as agents in [illegible] mechanism [illegible] role which leucocytes can play in temporarily plugging capillaries. It was reported by Nicoll and Webb (1946) in the unanæsthetised bat's wing, and they recalled similar observations by Sandison in the rabbit. "Frequently," they wrote, "when the angle of origin is sharp, the leucocyte plugs the entrance of the capillary; while, in other cases, the slight indentations associated with endothelial cell nuclei offer ideal locations." The plugs, "which are often the determiners of flow in capillary fields," are removed either through increase in the blood pressure or through the amœboid activity of the leucocytes, or through a combination of these. The plugging occurs in normal fields with active blood flow and should not be confused with the events occurring in relatively stagnant fields preparatory to diapedesis of white blood cells.

With regard to Zweifach *et al.*, in the peripheral vascular fields which they have studied they have found what they style "vasomotion," *i.e.*, irregularly occurring series of dilatations and contractions of the metarterioles and pre-capillary sphincters, the intervals varying from fifteen seconds to three minutes. The phenomenon is very obvious in cine-records in which the movements are speeded up, and in one such a red blood corpuscle is seen to become entrapped as a pre-capillary sphincter closes down upon it. While such sphincters can completely occlude the entries into the pre-capillaries, the metarteriolar musculature merely reduces the [illegible]

sphincters causes longitudinal infoldings of the pre-capillary endothelium. On such occlusion of the pre-capillary beginnings, the remaining parts of these vessels and the whole extent of the true capillaries become bloodless as the last inflow passes on, but they do not become empty, for they fill up with fluid from the tissues. Passage from the venules into the distal part of the thoroughfare channels is thought to be aided by the acute angles at which the smaller vessels unite with the larger ones. In Nicoll and Webb's terminology, Zweifach *et al.* have demonstrated "active vasomotion" of the metarterioles and of the beginnings of the pre-capillaries, and "passive vasomotion" beyond those points.

In the studies of Sanders *et c* [illegible] to how the sympathetic nerve [illegible] effects upon the endothelial nucl[illegible] the nerve-endings lie upstrean [illegible] humoral substances liberated at the endings on nerve stimulation are assumed to pass downstream to produce their constrictor effects upon the metarteriolar and sphincteric musculature, effects which the workers in question hold to be imitated by adrenaline topically applied, though Wiedeman and Nicoll (1953) are critical of the technique.

No one at the present time can give a complete, or anywhere near complete, description of the nervous control of all the capillary regions (meta[illegible]) in any one species. [illegible] circulating h[illegible] a necessary c[illegible] simultaneously dilated, to accommodate an amount greater than the total blood volume, with consequent arrest of the circulation. Over such a general constrictor tone as has been suggested we can imagine local dilator influences prevailing, in active tissues through the demands of the cells for oxygen and to a lesser extent through the action of metabolites, in damaged tissues in susceptible species through the action of histamine and other liberated substances. In the ever-beating heart the minute blood-vessels must be about as fully on duty as the cardiac muscle itself, though presumably most active (*i.e.*, patent for exchange purposes) when that muscle is relaxed and vice versa. For the heart cannot accumulate an oxygen debt and, with twice the density of capillaries possessed by skeletal muscle, it desaturates far more completely than any other [illegible]

examples we can imagine the capillary variations in calibre produced during rest and activity in other organs, and to those we can add, as indicated, the effects of the vaso-active substances, vaso-excitor material (VEM) and vaso-depressor material (VDM) which form part of the total concept of Shorr, Zweifach, Chambers, Mazur, *et al.*

VEM, they say, is produced by the anoxic renal cortex, and is inactivated by the same tissue (and also, perhaps, to some extent by the liver) when its oxygen supply is restored. The action of the substance, which has not yet been chemically identified, is to increase vasomotion (in the authors' connotation of that word) and to render the metarteriolar and pre-capillary sphincter musculature more [illegible]

skeletal muscle and the spleen); it is inactivated by the liver when that organ's oxygen supply is back to normal, provided the anoxia has not lasted too long. VDM suppresses vasomotion and reduces the reactivity of the metarteriolar and sphincter musculature to adrenaline, so that blood stagnates in the peripheral vessels other than the thoroughfare channel, and the total flow throughout such thoroughfare channels in the body as a whole constitutes an inadequate total venous return. VDM was identified by Mazur *et al.* as ferritin, a sulphydryl-containing protein substance which can be antagonised by an antiserum, but there is appreciable opposition to the VDM story. In addition, some workers, *e.g.*, Delorme (1951), believe that the liver is affected by oxygen lack before the renal cortex, which seems at variance with the VEM-VDM schema.

The next points to be discussed in capillary physiology are blood-pressure and blood flow and, as a corollary to the latter, plasma skimming. With regard to measurements of blood-pressure, as shown by Landis (1934), indirect methods are of doubtful scientific value, while the direct one is technically difficult, requires considerable time, and in man can readily be applied only to the nail-bed capillaries, which can be affected by exposure to light and by variations in temperature; finally, the region must obviously be immobilised during the measuring process. However, the direct method has shown that in exposed tissues 20 to 30 per cent. of the peripheral resistance to blood flow is located in the capillaries; that there is a gradient in pressure from the arterial to the venous end of the capillary; and that in the frog, rat, guinea-pig, and man the osmotic pressure of the plasma colloids is below the average arterial capillary blood-pressure and above the average venous capillary one. In man these three values are about 36, 45, and 22 cm. H_2O respectively. Owing to the very great increase in the cross-sectional area of the vascular bed in the capillaries, the rate of blood flow is reduced to $\frac{1}{400}$ to $\frac{1}{800}$ that which obtains in the arterioles, and this drop in rate of flow reduces the frictional resistance which the great increase in total surface area tends to augment. Those specially interested in blood rheology can read Bayliss (1952). Here I shall content myself with the equivocal statement that the rate of flow in capillaries is often ±0·5 mm. per sec., and thus the time taken for transit is often ±1 sec. Very wide departures from

such values are naturally possible; Brown and O'Leary, to give but one instance, found rates in excess of 1·5 mm. per sec. in the human nail-bed capillaries up to the age of 40 and at room temperatures of 24° to 26° C. In the capillaries, as in most cases in the arterioles and venules, the blood corpuscles often run in an axial current, but there are many variations possible from so generalised a picture, and of these I shall specially mention that due to what Krogh first named "plasma skimming." This is due to the capillary being of such temporary calibre and leading off from the arteriole at such an angle that only the peripheral, cell-free zone of fluid in the larger vessel passes into the smaller one, it may flow quite rapidly through the capillary, as is shown when an occasional erythrocyte is detached from the axial stream in the arteriole and goes along with the skimmed plasma. The phenomenon, on a less isolated scale, may be of considerable importance in certain regions in certain circumstances, but can receive only this brief mention here, for we must now deal at some length with the capillaries as agents for exchange of substances with the tissues. As Drinker and Yoffey (1941) wrote: "The environment in which the cells of the body live is determined mainly by the permeability of the endothelial cells of the blood capillaries. This permeability is also responsible for the formation of lymph, which depends ultimately on the filtration of water and solutes from the blood." In passing it is worth while noting that the capillary cells themselves get first service from the water, oxygen, and solutes of various kinds which it is their function to pass on to the tissue cells in general,* and we can assume that their performance and control of this function is optimal when they are themselves fully supplied, and free from noxious degrees of chemical or physical insult. They are, however, resistant to moderate degrees of oxygen lack, and can recover from severer ones provided these last but a few minutes, so there is a wide range of normality, if we can judge from this one instance.

For the more general story of the exchanges I shall draw largely on Landis (1946) and Pappenheimer (1953), with some reference to Gilding (1951), Manery (1954), and others. The permeability of the endothelial cells to water and dissolved substances (about 3,000 times that of the surface membranes of some tissue cells) should properly be defined in terms of units of volume or mass passing through unit area of unit thickness in unit time under unit hydrostatic or unit osmotic pressure, and, even if an average total thickness is for convenience assumed, the determination of the other factors has been made, for technical reasons, all too seldom; further, the procedures are not free from the criticism that they often involve departures from normal conditions (long exposure to light being but one of these departures). Finally, if in respect of the microscopic anatomy we were Gullivers dealing with things infra-Lilliputian.

* Just as the heart receives the first service from the raising of the blood-pressure which its own activity has ensured. In other words, "Muzzle not the ox that treadeth out the corn" seems to be a natural precept.

we are infinitely more so here, where the light-microscope scale has changed to the molecular one. Nor can we, on the evidence provided, regard the endothelial cell wall as a uniformly resistant membrane.

It is stated that no secretory activity has yet been shown by the cells. If we accept that statement,* we have only to consider filtration and absorption, and diffusion. This last refers to the movement of a solvent or solute from a region of high concentration to one of low concentration as a result of the random and interfering movement of single molecules. When the molecules are lipid-soluble, as is the case with oxygen and carbon dioxide, they are not restricted in their diffusion to relatively small portions of the total capillary surface area, but pass through the cell membranes themselves at rates so great that, in the cases of at least some substances, no osmotic transients are detectable. Rates in general increase with lipid-water partition coefficients but in the order opposite to that expected on the basis of the aqueous diffusion coefficients of the substances.

Water-soluble substances, in contradistinction to these lipid-soluble ones, depend for their exchange upon filtration and absorption

pressure of the blood plus the osmotic pressure of the tissue fluid exceeds the osmotic pressure of the blood plus the hydrostatic pressure of the tissue fluid; absorption when the reverse obtains. In certain direct experiments the balance was found by Landis to favour filtration at the arterial ends of the capillaries and absorption at the venous ends, but the body is not run on such simple lines and often the blood-pressure throughout a capillary must be such that no absorption occurs anywhere along its length, in which case the return flow is via the lymphatics. Samples of true capillary filtrate have not so far been obtained; it is changed somewhat by

* A few years ago I thought neuroglia cells particularly inactive. Then, in 1951, I saw Dr Charles M. Pomerat's film of such cells, in tissue culture, actively engulfing and discharging the fluid in which they were. So present ideas are not necessarily final ones.

Diffusion can occur simultaneously with filtration and absorption, and not necessarily in the same direction. It is this process, rather than hæmodynamic flow, that effects the rapid interchange of small molecules between blood plasma and interstitial fluid. The passage is easiest for water; nearly as easy for urea, sodium, chloride, and nitrate; and relatively easy for calcium, magnesium, glucose, and amino-acids. On the other hand, it takes about half an hour for 50 per cent. of introduced gelatin and isinglass to escape, and in many capillaries (those of the liver and intestine are exceptionally permeable) 93 to 95 per cent. of the plasma proteins are retained. The amounts of water, sodium chloride, urea, and glucose respectively that pass in both directions by diffusion have been estimated as eighty, forty, thirty, and ten times the amounts of those substances that reach the capillaries in the same length of time in the plasma. Despite this, the amounts are far less than the ones calculated on the assumption that free diffusion occurs over the whole of the capillary surface area, and this and other considerations have led to the idea that the exchange of non-lipid-soluble substances is restricted to about 0·2 per cen ... addition the transit is effected through water- ... are about 30 to 45 Å. As the ... globulin, and fibrinogen are all 33 to 38 Å, these substances can all pass through such pores, and their respective molecular weights (69,000, 169,000, and 500,000) are thus reflections of their lengths, which means that the heavier molecules take longer to pass through the pores but otherwise are on an equality with the lightest ones. In general, apart from this, the degree of molecular sieving of any solvent in its outward passage during simultaneous diffusion and filtration depends on molecular size. With small molecules, the ... membranes, though not ... those of the plasma proteins, the sieving is high even at normal filtration rates, though at abnormally low ones even these relatively huge molecules would be likely to approach diffusion equilibrium with the ultrafiltrate. We can say, thus, that diffusion of large molecules is in any case restricted, but becomes increasingly so with rise in filtration-absorption.

The above scheme is in the main the outcome of the experimental ... and (less completely) those in the renal glomeruli of the frog and of ... very great variations, ... 56, 2 to 5, 220, and ... that not everyone accepts without reserve the conclusions of the authors, particularly with respect to the existence of pores in the capillary wall.

Two further notes must be added to this very abbreviated story. The first is that in many places the composition of the tissue or body fluid is dependent not only upon the transcapillary processes described above, but also upon the activity of a second, epithelial barrier. Synovial fluid, aqueous humour, cerebrospinal fluid, extracellular fluid of brain tissue, etc., were instanced by Chambers ... il.

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ries in

the skeletal muscles of mammals increases progressively along their course and is greatest where they pass into the least venules. The gradient of permeability is so largely independent of functional ... that it is determined by inherent

urinary bladder the interlacing of capillaries, their progressive widening, and a consequent gradual slowing of the blood flow act to achieve the same end. Here a gradient of permeability has not ...

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unnecessary any provision

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fibre, and where cells of ...
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as constant as possible but it must be the same, by and large, for all the cells."

We must now pass on to short notes about the passage outwards from capillaries, on occasion, of white and red blood corpuscles. The white cells in question are first and foremost the neutrophil polymorphs, but others can also be affected, with variations according to ... capillaries are exposed to heat, chemical

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cells
somewhat swollen. The passage of the wall by ... ph is effected in stages; first a pseudopodium gets through, and then bit

by bit the rest of the cell until the whole is through and the temporary breach in the wall closes. Once outside the endothelium, the polymorph may remain for a while somewhat flattened between that surface and the perithelium, but eventually it migrates away through the interstices of the latter. The locus of the diapedesis is commonly held to be the intercellular cement, and in at least some cases the stimulus to the movement of the white cell appears to be the liberation by tissue cells of a (?) polypeptide positive-chemotactic agent, leucotaxin.

In contrast to the active migration outwards of white cells is the passive movement outwards, on occasion, of red blood cells. Three factors can separately or severally be concerned, namely, heightened capillary blood-pressure, weakening of the intercellular cement [illegible] endothelial [illegible] ly [illegible] est [illegible] ea of antecubital skin in response to occlusion of the upper arm at a given pressure for a given period of time. The evidence for the intercellular cement being in some cases concerned is also evidence for the view that the red blood corpuscles get out between, rather than through, the endothelial cells. Perfusion with calcium-free fluid weakens the cement and increases capillary fragility, absence of vitamin C makes the building up of the cement impossible and increases fragility. The evidence for reduction of the perithelial support of the endothelial tube being on occasion concerned is (1) that hyaluronidase, intravenously administered or locally applied, leads to no great increase in permeability or in stickiness of the capillary wall but does lead abruptly to microscopic petechiæ; (2) that certain hyaluronidase-containing bacterial toxins, intravascularly injected into various mammals, produce mesenteric and omental petechiæ with no obvious dissolution of the intercellular cement. In concluding this section, we should stress that increased capillary permeability and increased capillary fragility can occur independently one of the other.

Did time permit, I should like to detail what is known about the capillary provision and functioning in individual organs to correlate such with what is known about the activities of those organs. Obviously, too, I have omitted consideration of the development of capillaries, their increase in number with training (Anon., 1954), the effects—in so far as these are published—of ageing upon them, and much beside. However, part of this sum total is beyond my terms of reference, and certainly the whole of it is beyond my allocation of time and space.

What in general can we say as the result of our review? The first comment must, I think be that we know very much more about the capillaries than our predecessors of three decades ago. The second comment, on the other hand, must be that even so what has been accomplished is but a very small beginning compared with

what is desirable. For what ideally we want is a series of visualisations of the capillaries in activity from the first appearance of such vessels in the embryo right on through all the subsequent changes until the termination of the individual's existence by death. When our successors have such pictures they will, I forecast, be cognisant of an exquisite adaptation of the normal capillary blood flow and exchanges to the ever-fluctuating requirements of the tissue cells,

standard, we are at present very imperfectly informed about the small vessels in question, but awareness of an ultimate goal is the proper directive to current research, and this survey will have served its purpose if it has made us more aware of that goal.

ACKNOWLEDGMENTS

I wish to thank Professor H. P. Gilding and Dr F. J. Aumonier for various help.

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DACSO, M. M., New York. *Changes in the circulation of the hemiplegic extremities: an experimental and clinical study.*

THE rapid growth of our ageing population has resulted in a disproportionate increase of the chronically ill. As a result of this situation a sudden upsurge of interest in chronic diseases can be observed in clinical medicine. The treatment of hemiplegia, a heretofore neglected clinical entity, has benefited a great deal from these developments.

In studying the hemiplegic we were impressed by the fact that the average clinician is still primarily concerned with motor paralysis as the most predominant feature of this condition. Other important aspects, *e.g.*, sensory changes, aphasia, hemianopia, mental deterioration, changes in the autonomous innervation, etc., are still unduly neglected in everyday clinical practice.

In the following brief survey we shall attempt to give a summary of our present knowledge of this problem (Table I) and to report

rown-Séquard by 1863 had temperature changes in the hemiplegic extremity, but it remained for Chevallier in 1867 to publish a more extensive study entitled "On the Paralysis of Vasomotor Nerves in Hemiplegia." Since then this problem has received only sporadic interest in medical literature and has never penetrated into actual clinical medicine.

While observing a wealth of clinical material we have been impressed by the comparative frequency of signs and symptoms that could be attributed to changes in peripheral circulation. Changes in the radial pulse are rather rare, but Zenner and Kramer (1909) reported a 57-year-old man whose right radial pulse became imperceptible during the course of two subsequent operations

(for a meningioma) in the left central region. The left radial pulse remained intact during the operation. After both operations the absence of radial pulse was observed for about one day.

TABLE I

Name.	Ætiology.	Changes.	Method.
Gubler, 1856	Cerebrovascular accident	Temperature changes (?)	?
Brown-Séquard, 1863	Cerebrovascular accident	Increased temperature	?
Chevallier, 1867	Cerebrovascular accident	Increased temperature	Thermometry
Gowers, 1886	Cerebrovascular accident	Vasomotor and trophic	
Zenner and Kramer, 1909	Operation for meningioma	Temporary disappearance of radial pulse	
Kennard, 1934	Tumour premotor area	Increased temperature	Thermometry
Bucy, 1935	Trauma	Temporary disappearance of radial pulse	
Ellis and Weiss, 1936	Cerebrovascular accident	Increased blood flow	A-V O_2 difference
Dacso, 1945	Cerebrovascular accident	Increased and decreased fluorescence	Dermofluorometry
Hoener and Dacso *et al*, 1953	Cerebrovascular accident	Increased blood flow	Na^{24} injection

Bucy in 1935 reported another case in which a lesion of the left internal capsule resulted in marked vasoconstriction in the right arm [illegible] These experiences [illegible] ot too well-defined [illegible] n may cause vaso- [illegible] extremity. Later, [illegible] blood flow in the paralysed arm was regularly found to be greater than in the normal arm. The flow in the affected leg frequently was greater than that in t[illegible]

obs [illegible]

and [illegible]

oth [illegible]

ture [illegible] even after removal of the tumour. To add another conflicting opinion to the controversy, Williams and Scott (1939) found that removal of the entire cerebral hemisphere did not alter the vasomotor responses in the fingers. In an experimental study Kennard (1934), working with monkeys and chimpanzees, found that lesions of the premotor area lowered the temperature of the contralateral side. This, she suggested, was due to alterations in the mechanism of vasodilation.

In our own experiments several years ago, using intravenous fluorescein and dermofluorographic instrumentation, we were able to establish the following, namely:—

1. The peripheral blood circulation of the hemiplegic extremity, as indicated by the degree of fluorescence, was noticeably different from that of the unaffected side.
2. In some cases the fluorescence in the hemiplegic extremity was higher than that of the unaffected side, whereas in other cases it was lower.
3. On the affected side there was no consistent correlation of the relative fluorescence of the upper and lower extremities. In some cases they were identical; in others one was higher than the other.

In other words, by using this method we could establish the fact [illegible]

In view of our recent experiences we plan to reopen these experiments again.

In searching for new methods to help clarify this important but still poorly explained aspect of hemiplegia, we turned our attention to radioactive isotopes used as "tracers." We felt that with the recent improvements this methodology is ready to be used in clinical investigation.

Experimental subjects—Our experiences were derived from experiments with forty-three hemiplegic patients in our department. In addition, nine people without any demonstrable pathology were investigated.

Methodology—After carefully considering several "tracers" we decided to start with Na^{24}. This has a half-life of 14·8 hours, is not selectively absorbed [illegible] peripheral vascular studies.

The emissions from radioactive sodium consist of hard beta and gamma rays with a total energy value of 2·8 million electron volts/disintegration. The beta rays are mostly absorbed in the body tissues, but the gamma rays can be easily recorded by suitable instruments.

This experimental set-up consisted of the following (Fig. 1):—

1. Geiger-Müller tube.
2. Count rate meter.
3. Esterline-Angus graphic meter.

For sake of brevity the detailed description of these technical devices will be omitted. A description of their function should serve as explanation.

Experiments—The patients were placed in a draft-free room with

... humidity and were allowed

... echanical device on the dorsal metacarpal area of the hand. (I wish to interject here that this site for physiological reasons was not found ideal, and in our subsequent studies we intend to change it.) The Geiger-Muller tube was connected to the above-described counting and recording system. An independent, but identical, set-up was applied to the contralateral extremity which served as control. It is important

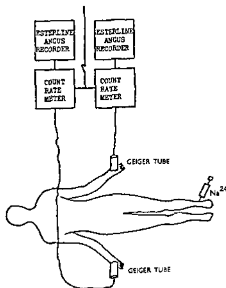


FIG. 1

to mention that with the use of a master switch these two independent units could be activated simultaneously.

After the patient had been connected with the equipment, 140 to 160 microcuries of radioactive sodium in less than 1·5 ml. of saline was injected into either the antecubital or dorsal foot vein. As soon as the injection was completed, the entire equipment was activated by the use of the master switch, and the tracing began to appear on the Esterline-Angus chart (Fig. 2). Thereupon an ... ed on the

... n normals

and represents the circulation time. The second part designated as B-C represents the segment that is sometimes referred to as

*"build-up" time. This segment depends not only on the intra-*vascular blood flow but also on permeation of the radioactive material

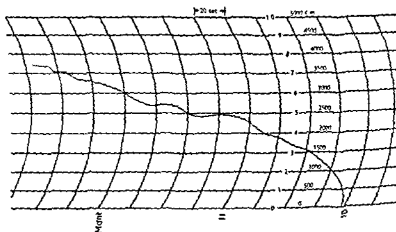


Fig. 2

Fig. 3

into the extravascular tissues. This is the segment that is greatly modified by impairment of circulation.

In using the method of Friedell *et al.* for calculating the "circulatory index" from this curve, we have a very convenient method of expressing the impairment of circulation and also of comparing this with the unimpaired contralateral extremity. It should be noted that high circulatory index signifies a decreased blood flow and, conversely, a low circulatory index denotes an increased blood flow.

TABLE II

	Mean Circulatory Index.	Standard Deviation.	Standard Error of Mean.
Normal extremities	7 03	2·40	0·57
Hemiplegia, apparently normal extremities	7 75	4 24	0·65
Spastic hemiplegic extremities	7·90	2·76	0·50
Diffuse cerebral damage, hemiplegic involved extremities	5·28	1·70	0·40
Over 55 years, hemiplegic involved extremities	4 74	2·60	0·52
Flaccid hemiplegic extremities—left and right	4·95	1·18	0·33
Flaccid hemiplegic extremities—left	4·43	0·85	0·38
Flaccid hemiplegic extremities—right	5·28	1·28	0·45

TABLE III

Comparison of Groups.	Circulatory Indices, Mean Difference.	Standard Deviation of Difference.	Critical Ratio (Statistical Difference) of Groups.
Normal—over 55 years	−2·29	0·77	2·97
Normal—diffuse cerebral damage	−1·75	0 69	2·54
Normal—right flaccid	−1·75	0·72	2·43
Normal—left flaccid	−2 60	0·68	3·82
Normal—left and right flaccid	−2·08	0 66	3·15

Results—Upon evaluating our experimental results we found that build-up rates, as measured by the above-described method and ... similar in the non-involved upper ... the normal ... is that the ... be used as ... intents and purposes be considered normal.

An analysis of our figures derived from experiments with forty-three patients indicated that none of them showed evidence of

decreased activity, meaning in this instance, decreased blood flow

showed clinical signs of flaccidity, were 55 years or over, and some of them displayed signs of advanced diffuse cerebral damage. Since many of these patients showed more than one of these conditions, it appeared important to us to devise methods to separate them from one another. Furthermore, it is of great importance to establish whether the increased activity indicated increased blood flow, an increase in the number of active capillaries, increased permeability, or a combination of these three factors.

Our present experiments, in which we use radioactive iodinated human serum albumin, are expected to help answer this question. Our assumption is that in iodinated human serum albumin, where the radioactive tracer is attached to an albumin molecule whose molecular weight is in the range of 50 to 60,000, will not permeate the vascular wall so readily. This being so, whatever changes we ... variations in the calibre of

COMMENTS

In addition to the easily recognisable clinical signs, such as ... nail deformities etc.

to the nature of these changes, namely, whether they are due to vasodilation or v ... exists.
According to ou
of vasoconstricti
extensive brain
changes. Altho
indicating peripheral vasodilation after destruction of certain brain areas, we are still unprepared to advance a clinical explanation for these changes. It appears to us quite certain, however, that these alterations of peripheral circulation are due to cerebral rather than peripheral changes.

CONCLUSION

We have surveyed the past literature pertaining to peripheral circulatory changes in the hemiplegic, ... definitive

the direction of vasodilation. It was also indicated that certain groups of patients showed statistically more significant changes than others.

It is our impression that the application of radioactive isotopes is probably the best method used so far in the study of the hemiplegic circulation, and we therefore urge its widest possible use.

OL[illegible] ELUNED,* and
[illegible] *urement of cardiac*

Introduction—Recent development in certain branches of surgery and medicine has led to the necessity for measurement of cardiac output. Successful work has already been carried out to establish a firm basis for this measurement, but the data available on cardiac hæmodynamics for people over the age of 60 are scanty and contradictory.

For the measurement of cardiac output, three different methods are in general use which vary greatly in both technique and accuracy.

Our aim has been to find a method which would give fairly reliable [illegible]
It [illegible]

[illegible] depends on the use of the cardiac catheter. Forssman in Germany introduced the technique, and since then cardiac catheterisation has been popularised by Cournand and his co-workers in the United States of America and by McMichael and Sharpey-Schäfer in this country.

The principle of the measurement is simple: the amount of any [illegible] the organ. From this principle the oxygen uptake in the lung can be used to measure the pulmonary and hence the cardiac blood flow. When large variations of flow or of oxygen arteriovenous differences occur, the Fick principle cannot be applied. For instance, for five minutes [illegible]
[illegible] obtained will benefit the patient therapeutically, and it is certainly very rarely indicated in the aged.

2. **Ballistocardiographic method**—This was developed by Starr,

* Nuffield Research Fellow.

† Aided by a grant from the Nuffield Foundation and from the Scientific and Research Committee of Newcastle Regional Hospital Board.

who at first thought the ballistocardiograph measured cardiac output but later found that it measures force. It was further developed by Nickerson, who eliminated the natural oscillation of the Starr apparatus, using a low-frequency critically damped ballistocardiograph. Nickerson measured the cardiac output with his ballistocardiograph and compared the results with the direct Fick method, finding good agreement between the two methods. A criticism of the method has been that large differences in pulse-rate increase the error in cardiac output calculations from the ballisto- [illegible] outputs within 25 per cent. of the values obtained by the direct [illegible] it in 40 per cent.

Latterly Dutch workers have improved on the low-frequency apparatus by using a ballistocardiograph with an even lower frequency than Nickerson. [illegible] changes.

3. **Dye method**—The dye method, now designated indicator method, includes the use of radioactive substances in addition to [illegible] itput, [illegible] ideal [illegible] toxic, [illegible], and the concentration of dye should be easy to measure. Loss of dye due to leakage from the circulation with the plasma is a possible objection to the use [illegible] such as in burns. [illegible] error in colorimetr [illegible] hæmolysis, or residual dye from a previous measurement.

(*a*) *Evans blue dye*—After a trial of over fifty dyes, Evans blue was ultimately chosen as ideal because it is non-toxic and is easy to estimate quantitatively. In addition, it leaves the circulation slowly and therefore has the advantage that a measurement of general blood volume can be made. Only insignificant amounts of dye are eliminated through the capillary wall during the first two hours, [illegible] glands, [illegible] ears in [illegible] thirty [illegible] sorbed by the renal tubule.

It has been shown by photokymograph records taken with blood

flowing through a cuvette oxymeter that Evans blue mixes uniformly in the blood stream. Flow measurements taken with a rotameter in open chest dogs agree well with measurements for Evans blue: in forty-three determinations the differences ranged from +8 to −5 per cent.

The disadvantages of Evans blue are that it stains the skin, sometimes for as long as three months, and that the commercial [illegible]

and after further investigation we found it to be suitable also for the measurement of cardiac output. The special advantages of sodium fluorescein are that small quantities of blood only are required for the estimation of sodium fluorescein as compared with Evans blue (twenty-five times less) and the determination of dye concentration of fluorescein is carried out on whole blood, while in the case of Evans blue, plasma or serum must be used (after a ten-minute interval) which tends to yield higher results.

The amount of blood collected during a period of one second is ample for the estimation of fluorescein, but to ensure accurate measurement with Evans blue the blood must be collected for at least two seconds.

Since such small quantities of blood are required for fluorescein estimation, capillary blood can be used for the measurement of the general blood volume, whereas with Evans blue either venous or arterial blood is necessary.

A large amount of sodium fluorescein can be injected (1,000 to 1,500 mg.) without any toxic effect, and the staining of the skin persists for only about twenty-four hours to a maximum of forty-eight hours.

Chemistry

Fluorescein is one of the three triphenylmethane dyes obtained [illegible] to 200° C. Fluorescein

[illegible] lcohol and in

[illegible] scence. With

[illegible] scein forms a

[illegible] " fluorescein soluble" are weighed out and dissolved in pyrogen-free distilled water and made up to 100 ml. The dye solution is then filtered before being sterilised in ampoules. Six millilitres of this 25 per cent. solution of the dye is injected intravenously and contains 1,500 mg. of fluorescein sodium. For the purpose of injection a specially calibrated syringe is used and the error of this procedure has been found to be less than 1 per cent.

Preparation of standards—Standards are prepared by making dilutions of the dye, the concentrations ranging from 0·1 mg. to

0·6 mg. per cent. Four millilitres of the solution prepared for injection, containing 1,000 mg. dye, are made up to 1,000 ml. with distilled water, giving a solution of 100 mg. per cent. This 100 mg. per cent. solution is then diluted 10 in 100 with distilled water to give a 10 mg. per cent. standard and this standard is finally diluted to 1 in 100, 2 in 100, and so on to 6 in 100, giving standard solutions from 0·1 mg. to 0·6 mg. per cent.

Intensification of colour—The colour of aqueous solutions of fluorescein sodium is increased considerably by the addition of a small quantity of dilute alkaline solution. Table I records the optical densities of the various standards read at a wave-length of 480 μ.

TABLE I

COMPARISON OF THE OPTICAL DENSITIES OF AQUEOUS SOLUTIONS AND ALKALINE SOLUTIONS OF FLUORESCEIN SODIUM

Standard.	1 ml. Water plus 4 ml. Standard.	1 ml. *N*/10 NaOH plus 4 ml. Standard.
0·1 mg. per cent. .	0·044	0·108
0·2 mg. per cent. .	0·080	0·187
0·3 mg. per cent. .	0·114	0·258
0·4 mg. per cent. .	0·147	0·317
0·5 mg. per cent.	0·182	0·366

[illegible] hydroxide to produce [illegible] results.

Various strengths of sodium hydroxide were used to find their effect on the optical density of a solution of fluorescein sodium. The concentrations investigated varied from *N*/5 to *N*/5,000, and between these limits the optical density of a given solution of fluorescein was constant.

Selection of wave-length—The optical densities of an aqueous solution of fluorescein sodium were plotted against wave-length. The maximum optical density was found to be at 470 μ (Fig. 1).

The optical densities of an alkaline solution of fluorescein sodium were also recorded at different wave-lengths and the maximum [illegible]

[illegible] ing to zero C., [illegible] *solution* was investigated, but no alteration in colour was demonstrated. The dilute standards (0·1 mg. to 0·6 mg. per cent.) appear to remain constant for about twenty-four hours and then deteriorate very slightly during the next few days. The more concentrated solutions (10 mg. and 100 mg. per cent.) remain constant considerably longer than the dilute standards.

Measurement of fluorescein using bromine and ammonia—The alternative method of measurement of fluorescein sodium utilising bromine and ammonia in place of dilute sodium hydroxide was investigated. The optical densities of the pink colour produced with bromine and ammonia and read at a wave-length of 505 μ were slightly higher than those of the green colour produced with dilute alkalis, but the latter procedure proved to be easier and more convenient.

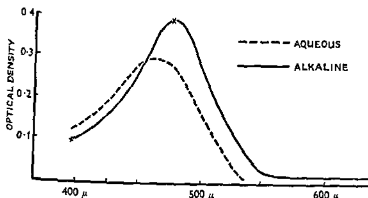


FIG. 1

Optical densities of aqueous and alkaline solutions of fluorescein at the various wave-lengths.

Effect of plasma protein on fluorescein—The proportion of dye bound to the plasma protein was investigated. When the average total protein was 6·6 g. per cent., it was found by precipitation of the protein with tungstic acid that the proportion of dye bound was on the average 67 per cent. (57 to 83 per cent.). Although this proportion is lower than is the case with Evans blue, it is not considered that the loss of dye due to this cause during the first circuit is of a significant degree.

Recovery of Fluorescein Sodium from Venous Blood

Two separate 100-mg. quantities of fluorescein sodium are accurately weighed out in 100-ml. beakers.

The first 100 mg. of [illegible]
made up to 100 ml. wit [illegible]
remaining 100 mg. of d [illegible]
and made up to 100 ml [illegible]
blood to wash out the beaker.

Standards—The standards are obtained by diluting the 100 mg. per cent. dye in saline 3 in 1,000, 4 in 1,000, and 5 in 1,000 with aqua dest., giving 0·3, 0·4, and 0·5 mg. per cent. solutions.

Procedure—0·02 ml. 100 mg. per cent. standard is pipetted into 5 ml. saline (carried out in duplicate) and mixed thoroughly;

0·02 ml. plasma from 100 mg. per cent. blood is pipetted into 10 ml. saline and mixed thoroughly. The blood samples are then centrifuged for ten minutes at 3,000 revs. per min. Four millilitres of the supernatant fluid from each tube is then added to tubes containing 1 ml. *N*/10 NaOH solution. Four millilitres of each standard is similarly added to 1 ml. *N*/10 NaOH solution. The contents of the tubes are then read in the spectrophotometer at 480 μ.

The following results were obtained:—

TABLE II

RANGE AND STANDARD DENSITY

	Optical Density.		Milligrams per Cent. Dye.
Standard, 0·3 mg. per cent.	0·260		...
Standard, 0 4 mg. per cent.	0·320		...
Standard, 0 5 mg. per cent. .	0·368		...
0·02 ml. 100 mg. per cent. dye in saline	0·318	0·318	99 3
0 02 ml. 100 mg. per cent. dye in blood	0·315	0 316	98·0
0 01 ml. plasma	0·304	0·306	187·5

Recovery of dye from the blood

$=\frac{98\cdot 0}{99\cdot 3}\times 100=98\cdot 7$ per cent. of the recovery from the saline.

The packed cell volume of the blood used was found to be 53 per cent. by centrifuging at 3,000 revs. per min. until no further decrease in cell volume occurred.

Therefore the amount of dye contained in the plasma was

$\frac{(100-53)}{100}\times 187\cdot 5$ mg.$=88$ mg.$=88\cdot 6$ per cent. of the total dye.

The same procedure as described above was also carried out, using a bottle of blood prepared for transfusion purposes and about fourteen days old. The recovery of dye from this blood was 99·5 per cent., but the amount of dye contained in the plasma was only 56 per cent. of the total.

When fresh blood containing the dye was left for some days, it was found that the amount of dye present in the plasma decreased quite rapidly, although the concentration of dye in the whole blood remained practically the same.

Determination of Fluorescein Sodium in Blood

[illegible] is added to 5 ml. [illegible] injection of dye [illegible] Both tubes are inverted several times to mix and are centrifuged for ten minutes.

for setting the spectrophotometer to zero and the optical density of the test specimen is read off at 480 μ.

Standard curve—The standard curve is obtained by adding 4 ml. of each of the dilute standards to tubes containing 1 ml. of $N/10$ sodium hydroxide solution and reading the colour in the spectrophotometer at 480 μ. A smooth curve is obtained which begins to flatten out at a dye concentration of about 0·8 mg. per cent. A straight line relationship could not be obtained by reading the standards at alternative wave-lengths. All readings were made with a Unicam spectrophotometer, model SP 350.

The test solution is compared with this curve and the value obtained is multiplied by 250 to give the concentration of sodium fluorescein ... the following calculation :—

... 5 ml. of

6 ml. of

blood actually compared in the spectrophotometer. Let us assume that the concentration of fluorescein read off from the graph for the "test" be x mg. per cent.

Now, 100 ml. of this solution obviously contain x mg. of sodium fluorescein.

Therefore, 4 ml. of this solution contains $\frac{x \times 4}{100}$ mg. of sodium fluorescein.

It follows that four-fifths of 0·02 ml. of blood (0·016 ml.) contains $\frac{x}{25}$ mg.

Therefore, 100 ml. of blood contains

$$\frac{5 \times 100 \times x}{4 \times 0{\cdot}02 \times 25} \text{ mg.} = x \times 250 \text{ mg. sodium fluorescein.}$$

Technique of Clinical Procedure

Measurements are carried out in the early morning in the post-absorptive state, and half an hour before the test the patient is given an injection of $\frac{1}{6}$ gr. omnopon subcutaneously.

Before giving the injection into the antecubital vein, the site of injection and the site for withdrawal of blood from the femoral artery are carefully infiltrated with 2 per cent. procaine hydrochloride; this is important in order to make the procedure completely painless. Following this local anæsthesia, a 17-gauge Cournand needle is ... mediately after puncture of

16 cm. length, which is attached to the Cournand needle. Every

second (timed by a metronome) after zero time a blood sample is taken from the femoral artery. The time during which samples are taken varies from forty to seventy seconds according to the anticipated approximate circulation time.

During the period of sampling, the patient's opposite hand and arm are placed in hot water but not hot enough to be uncomfortable. When sampling from the femoral artery is complete, 0·1 ml. of

CONC. OF DYE.

TIME IN SECONDS

FIG. 2

capillary blood is collected from a finger-tip of the warmed hand at one to two-minute intervals for approximately ten minutes.

Estimations and calculations—(*a*) *Cardiac output* is calculated from the amount of dye injected divided by the average concentration [illegible] up the [illegible] ye and [illegible] mplete [illegible] imated [illegible] t time [illegible] vertical ascending limb, a narrow peak and a descending limb, [illegible] s steep than the ascending, which does not reach the base line but com-

mences to rise again. This rise is produced by recirculation of the dye. If the [illegible]

dye. In addition, it enables a theoretical curve of the first recirculation to be plotted [illegible]

con

con

plotted in a curve c_1, c_2, c_3, etc., giving the theoretical first recirculation.

Cardiac output can be calculated as follows:—

$$CO = \frac{I \times 60}{\Sigma\,(c)}.$$

Where CO = Cardiac output.
I = Amount of dye injected in milligrams.
c = Concentration of dye in arterial blood samples.
Σ = Sum of ——.

(b) *The anatomy of the curve*—

(1) *First arrival of dye* (A): This represents those particles of dye which have arrived at the point of collection by the quickest route.
(2) *Peak* (P): This represents the time at which the bulk of the dye arrives at the point of collection and corresponds approximately to the time when fluorescence appears in the skin or mucous membranes.
(3) *Recirculation time*: Recirculation time is taken to commence where the break occurs in the straight slope of the descending limb.
(4) *Circulation time*: The point where the extrapolated descending limb of the curve meets the base line is assumed to be the time when the first circuit is complete.

(c) *The mean circulation time* is obtained from the time-concentration curve either by measuring the area beneath the curve planimetrically or by counting the squares under the curve. The point where a vertical line dividing this area into two equal parts cuts the abscissa is the mean circulation time. An alternative method is to use the equation:—

$$MCT = \frac{\Sigma(c \times t)}{\Sigma\,(c)}.$$

Where MCT = Mean circulation time.
t = Time in seconds.

In estimating mean circulation time by the Evans blue method, various authors use different times as starting point for the calculation. Some take the mid-point of injection as zero, whereas others take the point of first arrival of dye in the arterial sample. This is one of the reasons for discrepancies in reported values. In our

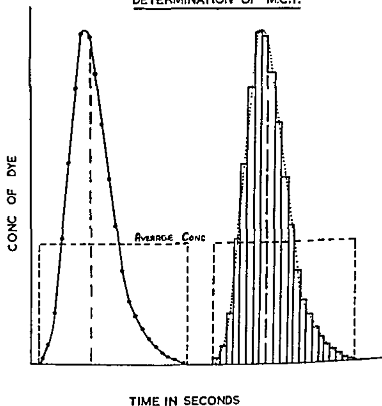


FIG. 3

method we have taken the concentration at point A (Fig. 2), the starting point of first arrival of dye, as zero time.

(*d*) *The estimated pulmonary (cardio-thoracic) blood volume* is the product of the mean circulation time in seconds and the cardiac output in millilitres per minute divided by 60.

$$PBV = \frac{MCT \times CO}{60} \text{ ml.}$$

Where PBV = Pulmonary blood volume.

This contains the volume of blood from the point of injection to the point of collection. The volume of blood from the point of injection to the right auricle is negligible. The volume of blood from

the *origin* of the aorta to the point of collection in the femoral artery is assumed *to* be 81 *ml.* times the surface area in square metres.

$$ABC = 81 \times SA \text{ ml.}$$

Where ABC = Arterial blood content.

SA = Surface area per square metre.

This sum subtracted from the estimated pulmonary blood volume gives the calculated pulmonary blood volume.

(*e*) *The general blood volume* is usually calculated from a ten-minute venous sample with Evans blue. A more reliable and accurate

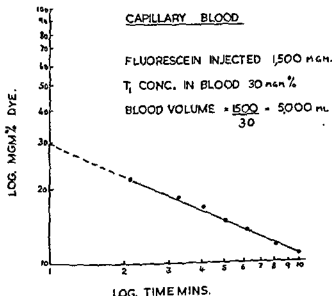


FIG. 4

estimate has been described using arterial blood samples. The concentrations of these are plotted semi-logarithmically against time and extrapolated to zero time.

Sodium fluorescein was chosen to take advantage of the smaller quantities required. We were able to use samples of capillary blood.

time, a straight line

al error during the

line is extrapolated

volume obtained is

independent of the angle of the slope. By comparison of the concentrations of sodium fluorescein in arterial, capillary, and venous blood the following general blood volumes were found: Measured from venous blood, 3,408 ml; from capillary blood, 3,658 ml.; and from arterial blood, 3,845 ml. (Fig. 5). All figures are the average for the findings in twenty cases.

The differences between venous and arterial blood and between arterial and capillary blood were 437 and 180 ml. respectively; this latter difference is indeed very small. The fluorescein and Evans blue methods were
measurement of general
average difference betweer
per square metre as mea
not statistically significant.

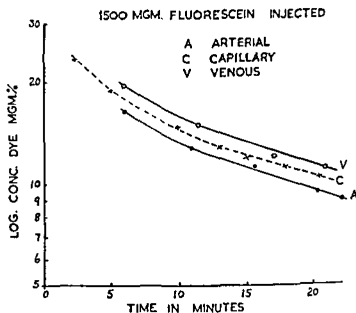


FIG. 5

(*f*) *Derived values*—

(1) *Peripheral resistance:* Measured in dyn./sec./cm.$^{-5}$ by the equation

$$PR = \frac{1332 \times Pm \times 60}{CO}.$$

Where PR = Peripheral resistance.
Pm = Mean blood-pressure.

$$Pm = \tfrac{1}{3}Pp + Pd.$$

Where Pp = Pulse pressure.
Pd = Diastolic blood-pressure.

(2) *Cardiac power:* Expressed in kilogram metres per minute (kg./m./min.).

$$CP = \frac{13 \cdot 6 \times Pm \times CO}{1000}.$$

Where CP = Cardiac power.

cardiac index in coronary thrombosis, coronary ischæmia, and ... failure is expected. The

average age 76 and 72 years respectively.

The group designated "frail" suffered from wasting diseases such as cancer, malnutrition, and rheumatoid arthritis, but all had normal ECG's, and at the average age of 74 years they show a fairly low cardiac index. Cases of left ventricular failure in which we measured the cardiac index were all in failure only to a mild degree, and their cardiac index was not significantly lower than that of the appropriate age group. In chronic bronchitis the cardiac index was high in the group ... ECG's ... the in... bronch... considerable improvement after treatment (Table IV).

Circulation time—From the anatomy of the time-concentration curve it is clear that both different parts of the blood and different particles ... at speeds within the circulation. For this ... The ... com... measurement. ... used in different cases, reliable comparisons can be made.

(*a*) *First arrival of dye* (FAD.)—The quickest time for circulating dye particles measured from the mid-time of the injection to the first arterial sample in which dye appears (femoral artery) is eight seconds in the young and twelve to fifteen seconds in the aged, rising with advancing years (Table V). This time diminishes in hypoxia and increases again in heart-failure. In coronary insufficiency the time is 14·8 seconds, in coronary thrombosis 14·6 seconds, in the left ventricular failure 15·5 seconds, and in auricular fibrillation 17·5 seconds.

(*b*) *The peak of the time-concentration curve* in the young is reached after 7·1 seconds as measured from the time of first arrival of the dye, *i.e.*, from A to B (Fig. 2), whereas in the same cases the mean circulation time is 8·5 seconds (Table V). A similar ...

... cribed as the ... taken for the ... time is taken from ...

curve, *i.e.*, A to T. In terms of this definition the normal circulation

TABLE III

	Normal Young.	Schizo. 18 to 49.	60 to 69.	70 to 79.	80 to 89.	Hypoxia.	Normal Excited.
MCT (secs)	12·2±2·2	8·5±1·5	9·9±1·6	9·66±2·1	10·9±2	8·9	6 87
Cardiac index (litres/sq.m. SA)	4·1±0·83	5·23±0·24	3·98±0·70	3·66±0 60	3·55±0·50	4·10	6 40
PBV (ml./sq.m. SA)	1140±180	738±135	672±66	622±155	644±151	626	726
GBV (ml./sq.m. SA)	2510±380	3252±411	3029±350	2850±498	2369±353	2724	3408
$\frac{PBV}{GBV}$ per cent.	22·5±4·0	23·2±3·6	22·1±2·4	22·1±2·8	20·7±0·7	17·8	21·6
Cardiac power (kg./m./min.)	7·9	13·2±2·4	8·14±0·74	8·75±1·1	7·7±1·9	9·17	14·5
Peripheral resistance (dyn./sec./cm.$^{-5}$)	1189	945±177	1143±318	1447±310	1311±292	1175	827
Blood-pressure	120/80	150/84	152/82	156/77	148/71	152/72	155/80
Hæmoglobin (per cent.)	100	98	84	83	82	64	92

MCT = Mean circulation time.
PBV = Pulmonary blood volume.
GBV = General blood volume.
ml./sq.m. SA = Millilitres per square metre surface area.

TABLE IV

	Coronary Thrombosis.	Coronary Ischæmia.	*Frail.*	Auricular *Fibrillation.*	Congestive Failure.	Left Ventricular Failure.	Chronic Bronchitis and Emphy-*sema,* Normal FCG.	Chronic Bronchitis and Emphy-*sema,* Abnormal ECG.	Chronic Bronchitis *and* Emphysema, BT.	Chronic Bronchitis and Emphysema, AT.
MCT (secs) . .	13 1	12·8	13 2	16 8	15·3	14	8·7	10·7	19 9	11·9
Cardiac index (litres/sq m. SA)	3 5	2 8	2·8	2 7	2·9	3·4	4·97	3·79	2·24	3·30
PBV (ml /sq m. SA)	699	557	605	744	862	760	708	658	678	645
GBV (*ml./sq m. SA*)	2940	3022	2742	2998	3238	3221	3184	3418	2141	3457
$\frac{PBV}{GBV}$ per cent. .	25·2	19·6	23 4	24 7	26·6	23 1	22 1	19 3	31 7	18·7
Cardiac power (kg./m./min)	9 42	6 06	5·7	4 5	6 8	10 6	10 2	8 9	5 07	6·69
Peripheral resistance (dyn./sec./cm.$^{-5}$)	1498	1824	1874	1535	1708	2208	1217	1410	2279	1415
Blood-pressure .	130/72	144/75	134/76	118/63	155/75	213/115	153/78	150/77	130/90	150/65
Hæmoglobin (per cent.)	85	77	74	81	83	88	92	84	75	74

MCT = Mean circulation time.
PBV = Pulmonary blood volume.
GBV – General blood volume.

ml./sq m SA – Millilitres per square metre surface area
BT = *Before treatment*
AT – After treatment

TABLE V

AVERAGE VALUES IN SECONDS

	Normals.				Hypoxia.	Coronary Insufficiency.	Coronary Ischæmia.	Left Ventricular Failure.	Auricular Fibrillation.
	20 to 49 Years.	*60 to 69* Years.	*70 to 79* Years.	*80 to 89* Years.					
FAD .	8 0	12·0	12 6	15·0	12·0	14·8	14·6	15·5	17·5
Peak .	7·1	8·3	9·0	10·2	7·6	11 0	11·8	12·3	14·5
MCT .	8·5	9·9	9·7	10·9	8·9	12·8	13·1	14 0	16 8
RCT .	16 9	18·7	18·5	19·6	17·6	22·4	23·1	22·1	28·5
CT .	29·9	31·0	30·3	32·0	31·0	41·0	41 0	48·0	57 0

FAD = First arrival of dye.
MCT = Mean circulation time.

RCT = Recirculation time.
CT = Circulation time.

time is about thirty seconds, increases to thirty-one to thirty-two seconds in the aged, and in those who have cardiac failure from forty-two to fifty-seven seconds according to the degree of severity of failure.

Pulmonary (cardio-thoracic) blood volume (Tables III and IV)—The pulmonary blood volume (millilitres per square meter surface area) is about 800 ml. in the young and around 650 ml. in the aged. It increases especially in congestive failure, and this increase is parallel to the measurement of the transverse diameter of the heart on screening. The pulmonary blood volume decreases in coronary ischæmia and in the frail group more than in the corresponding age group. The pulmonary blood volume is found to have decreased after treatment of heart-failure.

General blood volume (Tables III and IV)—General blood volume (millilitres per square metre per surface area) increases in heart-failure. The ratio of pulmonary blood volume to general blood volume, expressed as $\frac{PBV}{GBV}$ per cent., shows a decrease in the aged and a considerable increase in cor pulmonale, in congestive failure, and in some cases of coronary [illegible]

Ca [illegible]
in kilo [illegible]
extent [illegible]
ischæmia as well as in chronic venous congestion.

Peripheral resistance (Tables III and IV)—It would appear from these measurements that there is no significant correlation with age, but a marked increase of resistance is found in cases of cardiac failure.

DISCUSSION

The interest of the physiologist is to find absolute values. The clinician attempts to approach this ideal within his limitations. The more accurate and basic method of measurement of cardiac output by cardiac catheter cannot be employed in the aged because of the [illegible]

[illegible] has been found to be a useful tool not only in the measurement of cardiac index and pulmonary blood volume but also when measuring circulation time and general blood volume changes.

The advantages of this dye have been described and the flexibility of the method in health and disease demonstrated.

SUMMARY AND CONCLUSIONS

1. The methods of measuring cardiac output are reviewed briefly.
2. The relative advantages and disadvantages of dye methods are discussed.

3. The chemistry and estimation of sodium fluorescein in blood and the clinical techniques are described.

4. Measurements of cardiac output, circulation time, pulmonary [illegible]

DISCUSSION

Dr N. W. Shock (Baltimore): "This is a very interesting and important communication, and I express my interest in the use of sodium [illegible]

of uneasiness in using the cardiac catheterisation technique with older patients, particularly those who have been selected primarily because of their freedom from cardiac disease; and, therefore, there can be no implication that the test is made for diagnostic purposes.

"We have done a few direct measurements. At least, in our [illegible] greater than [illegible] ion method. [illegible] problem of patients who remain blue for a long time. Our protection in this is that the patients are maintained in our own wards, so that we know what happens to them and they do not get popped into oxygen tents and have other treatments offered to them.

"The general downward trend in cardiac output is a new finding, because the previous results from the literature—the most extensive being the series published by Dr Lewis—showed only a 6 to 10 per [illegible] nts [illegible] ase over that age span.

"Dr Olbrich is to be complimented in adding a new technique to our material. I am quite surprised that he was able to get results of this nature utilising capillary blood, because that, too, would be a definite improvement in the technique available to us."

Dr J. C. Aub (U.S.A.): "I am fascinated by the fact that the blue dye stays longer in the skin in older than younger people. Why should that happen?"

Dr Olbrich: "I do not know why the skin remains blue longer. It was a great worry to me. I tried to measure the amount in the urine and the rate of disappearance. In a later case the renal tubule was stained blue. It does not come out suddenly. It goes to the kidney, is reabsorbed back, and then goes again into circulation. The dye—the Evans blue—remains a fairly long time. If you repeat Evans blue measurement, you get much higher concentration values than if you use the first standard dye; but why it remains in the skin so long I cannot say."

DR SHOCK: "I have one piece of information that might be of interest to Dr Aub. Noting what we thought was an age difference in the elimination of the Evans blue, we attempted to compare the slope of the long-term curves on the rate of loss, and in terms of those curves we could not find any age difference. So I presume that if it sticks in the skin there is something in the skin that is involved, rather than the rate at which the kidney is actually able to eliminate the part of it that gets free at any moment."

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GROLLMAN, A., Dallas. *The interrelationship of hypertension, arteriosclerosis, and the ageing process.*

ARTERIOSCLEROSIS and hypertension, because of their high incidence, morbidity, and frequent cause of death, represent the greatest problem in medicine to-day. In fact, these disorders are so increasingly common with increasing age that some have considered them as inevitable consequences of the ageing process and a normal concomitant of senescence. Both hypertension and arteriosclerosis make their presence evident by an increase in blood-pressure. This, plus the fact (as we shall see later) that they often mutually accelerate the development of one another and hence occur together in many patients, has led to great confusion both experimentally and clinically. Such confusion is unfortunate since the conditions are not only pathogenetically of different origin, but also because the prognosis, course, and treatment of the two disorders is entirely unrelated.

[illegible] with an ele[illegible] hy[illegible] to much confusion in both experimental as well as clinical fields. The blood-pressure is a hæmodynamic function subject to control and alteration by many physiological as well as pathological

conditions. Hypertensive cardiovascular disease, on the other hand, represents a discrete clinical syndrome if we define it on the basis of the hæmodynamic, clinical, and pathological criteria which experimental and clinical observation have demonstrated to be characteristic of this disorder. The level of the blood-pressure is determined by the cardiac output, the elasticity of the vascular tree, its capacity, and, above all, by the peripheral vascular resistance.

In arteriosclerosis, either atherosclerosis affecting the larger vessels or the hyperplastic sclerosis which narrows the smaller vessels, the fundamental hæmodynamic effect is a loss of elasticity of the vascular bed. With a competent myocardium, adequate circulation through the tissues can only be maintained by an increased pulse pressure brought about by an increase in systolic pressure and a small decrease in diastolic pressure. It is the latter which differentiates arteriosclerosis from hypertensive disease, in which the fundamental disturbance is an increased peripheral resistance, not due to morphological alterations in the vessels, which are a consequence rather than a cause of the disease, and which results not only in an increased systolic but also in a marked increase in diastolic blood-pressure.

Recent experimental studies, details of which are presented elsewhere, indicate that hypertensive cardiovascular disease, if the term is limited to a well-defined syndrome and not used to indicate any rise in blood-pressure, is a disorder due to a renal dysfunction distinct from the excretory function of the kidney. The disease in man accompanies a variety of renal disturbances: (1) congenital, so-called hereditary or essential hypertension or due to obvious congenital anatomical defects of the urinary tract; (2) infectious, *e.g.*, the nephritides; or (3) vascular. It is the last-named which primarily concerns us here, since it explains why benign nephrosclerosis or arteriosclerosis involving the renal vessels results in hypertensive disease which, in this case, is secondary to the arteriosclerotic process.

Since arteriosclerosis and nephrosclerosis occur with increasing frequency with age, it is to be expected that hypertensive disease should do likewise. However, we must also consider another factor which in man, but not in certain other species, may also contribute to the increased frequency of hypertension with age, *viz.*, the abiotrophic changes of the kidney in which groups of glomeruli and complete nephrons disappear, giving rise to the irregular distortion of the renal contour characteristic of senescence. This, as well as the vascular (nutritional) disturbance due to nephrosclerosis, will result in hypertension of increasing severity with age.

There is good experimental evidence to indicate that hypertensive disease involves myocardial and vascular injury and that the mechanical effect of an increased blood-pressure itself may aggravate these changes. It is not unexpected, therefore, that hypertensive disease should accelerate the development of atherosclerosis and

arteriosclerosis, although involvement of the smallest vessels,

may terminate ten years later with a blood-pressure of 200/110 in which both disorders are present. The hypertensive patient with a blood-pressure of 160/100 may progress to 200/140 and show both hypertension and arteriosclerosis at autopsy.

DISCUSSION

Dr Olbrich: "I should like to ask Dr Grollman whether low diastolic pressure with high systolic pressure and without dilatation of the peripheral bed is responsible for the loss of the 'windkessel effect'?"

pressure continues, one finds a corresponding degree of nephrosclerosis. Unfortunately, in the human we can only check end results. We have to make up our minds ahead of time. I feel that this windkessel effect must be something to do with the low diastolic pressure."

Dr Olbrich: "In the aorta?"

Dr Grollman: "Yes. I have always felt that it had something to do with it. As true hypertension, with an increase in peripheral dilatation occurs, this is overcome. The normal systolic pressure individual has a certain degree of hypertension, although his diastolic pressure is quite normal."

GREPPI, E., Florence. *The temporal arteritis (Horton's disease) in the aged.*

Horton's temporal arteritis is an inflammatory process associated with arteriosclerosis in an elderly subject. The active inflammatory character of the local lesion manifests itself in typical cases by the presence of general signs, fever, raised blood sedimentation rate,

...ophils and giant cells, as well as narrowing and obliteration of the arterial lumen due to processes of thrombosis or necrosis. Surgical removal of the appropriate segment of the artery is followed by the disappearance of local pain. The process may, however, reappear again in other arterial segments in the region of the carotid

arteries or elsewhere, assuming the character of a severe diffuse angiopathy.

The disorder is peculiar in that typical and benign cases are limited to the superficial temporal artery in patients of both sexes over the age of 60 years. They usually have in addition arterial hypertension of a sclerotic ætiology. Medical literature contains few references to the syndrome, despite its unique clinical manifestations. A similar arteritis is found in young subjects but who are suffering from either per

t but short-lived therapeutic
use of cortisone or ACTH.

I believe that the arterial segment where the disease is localised may respond specifically to functional irritation or to inflammatory stimuli with the appearance of local swelling and pain. I have recently obs
violent head
temporal art
period of tir
the artery.

1. Male,
blood-pressure. He presented with temporal arteritis shortly after the development of unilateral retinal thrombosis; acute inflamma-
artery after surgical
orton's arteritis.
is of arteriosclerosis
with violent headache
resent for four years
The temporal artery
was very hard, tortuous, and painful. The surgical removal of a long segment of the artery was followed by an immediate and marked relief. Symptoms recurred after a short period of freedom, pain being present along the posterior branches of the same artery and in the region of the middle meningeal artery. The histological examination of a portion of the artery removed revealed a pure diffuse arteriosclerosis of the senile type without obliteration of the lumen or any

3. Female,
rial hypertension,
probably of
ined of a violent
unilateral hea
ton's disease were
present. Surg
owed by a marked
relief of symptoms. Malignant, nervous, and renal complications

of Horton's disease. Resection of the affected arterial segment brought about total disappearance of the local pain. The hypertension was not affected. Histological examination showed hypertrophy of the arterial media, while the intima was only slightly affected. The arterial lumen was narrowed, but there was no inflammatory infiltration.

In some cases of severe and prolonged unilateral hemicrania I [illegible]

often associated with arterial hypertension. This association of unilateral hemicrania and arterial hypertension resembles Horton's disease both in the site of the pain and in the swelling which is present in both conditions. Case 4 would seem to be an example of such an association. It appears that the regions of the external [illegible] ranch react not only to [illegible] and arterial hypertension, [illegible] hemicrania. Observation shows the variability of clinical, functional, and morphological pictures which may give rise to painful manifestations in the region of the temporal artery. The local syndrome has no age limit or [illegible]

ANTONINI, F. M., SALVINI, L., and SORDI, A., Florence.
Relationship between lipoproteins, heparinoid substances in plasma, and the pathogenesis of atherosclerosis.

THE possibility that lipoprotein metabolic block in atherosclerosis is due to a pathological deficiency in blood either of heparin or heparinoid substances has been proved. The amount of heparin in plasma has been determined by a reliable chemical method on normal and atherosclerotic subjects.

The heparinæmia presents great variations at different ages, lowering [illegible] old age. [illegible] of heparin is extremely low, [illegible] in normal subjects and in [illegible] significant. [illegible] per milligram of lipids has been determined, decreases with age, and is very low in every atherosclerotic patient. The variations of the β/α ratio at different ages and in atherosclerotic subjects are inversely proportional to the variations of the rate of plasma heparin. The highest values of the β/α ratio correspond to the lowest heparinæmia of atherosclerotic patients.

It can be concluded that the chronic deficiency of heparin seems

to play a pre-eminent role in the pathogenesis of atherosclerosis and to act on the metabolism of lipoproteins much more intensely than on the mechanism of clotting, which, in fact, does not appear to be related at all to heparin deficiency. The β/α ratio is a useful index of the situation of the plasma lipoproteins; the alterations of heparinæmia and the derangement of plasma lipoproteins, expressed by β/α ratio, seem to precede chronologically the anatomical and functional lesions of atherosclerosis. This statement permits the authors to formulate a diagnosis and a preventive treatment of atherosclerosis.

The effect of heparin on lipoprotein metabolism can be compared to the effect of insulin on sugar metabolism.

A therapy employing heparin can be reasonably tried on atherosclerotic subjects; such a therapy is based on the experimental data here described.

ANTONINI, F. M., Florence. *Serum glycolipoproteins, polysaccharides, and heparinoid substances in old age and atherosclerosis.*

The total polysaccharides linked to serum proteins increase with old age and especially in atherosclerosis, the increase varying inversely with heparinæmia.

The polysaccharides of some connective tissues and of the aorta appear particularly increased.

Among polysaccharides separated with protein fractions and revealed by Schiff's reaction for aldehydes, the polysaccharides which are linked to β fraction appear to have increased.

In atherosclerosis the increase of β/α ratio in lipoproteins corresponds to the increase of β/α ratio in polysaccharides linked to β and α protein fraction. Heparin tends to normalise this ratio by displacing polysaccharides from β to α protein fraction. The same phenomenon will occur with lipoproteins. Polysaccharides might constitute the link between lipids and proteins in the synthesis of glycolipoproteins, of which the fraction of serum separated through

[illegible] :oteins,
[illegible] is and
glycolipids are always to be considered in the formation of lipoproteins and particularly in the diseases leading to a profound [illegible]

[illegible] crease
[illegible] th the
same hormonic-enzymatic deficiency which, if on one side, inhibits the synthesis of heparin; on the other side it favours the scission and the depolymerisation of the most complex tissue polysaccharides. This might be the cause of non-sulphurated polysaccharide increase, linked in the serum to constitute with proteins and lipids, larger

and much less stable complexes, rich in neutral fats and cholesterol, with slower motility (glycolipoproteins), easily precipitable, in contrast with both normal complexes and with those formed through heparin action.

The localisation of lipids in many tissues in atherosclerosis and in old age might be due, besides, to an increased precipitability of some of these glycolipoproteins, also to the greater chemical affinity of some polysaccharides, particularly abundant in these tissues (cornea, skin, aorta, tendons, cartilages, etc.).

We may conclude that in the pathogenesis of atherosclerosis we must also consider, as a basis of lipoprotein derangement, an altered relationship between sulphurated and non-sulphurated polysaccharides, more or less depolymerised, both in tissues and in serum, and in consequence between the glycolipoproteins of which the serum fractions are formed. They may also characterise the chemico-physical behaviour of the blood lipids, their electric charge, motility, solubility, and also their localisation in those tissues where atherosclerotic lesions are frequently found.

ANTONINI, F. M., Florence. *The β/α ratio of plasma lipoproteins from youth to old age in human and experimental atherosclerosis.*

THE β/α ratio directly indicates the state of physical dispersion of the plasma lipids; the less soluble and dispersed the lipid molecules, the [illegible]
youtl [illegible]
in wo [illegible]
differ [illegible]
extent [illegible]
to exist between the β/α ratio and the number of mast cells per tissue unit in both sexes at different ages. The β/α ratio in atherosclerotic patients of both sexes from 40 to 70 years old is very high, and the difference from normal values in the same period of life is statistically very significant. Cholesterol, phospholipids, the C/P ratio, total lipids of plasma, prothrombin activity, and coagulation time are less significant than the β/α ratio to distinguish a normal subject from an atherosclerotic one.

Researches in experimental atherosclerotic rabbits confirm many of the findings observed in humans.

ANTONINI, F. M., SALVINI, L., and SORDI, A., Florence. *The effect of heparin on serum lipids and lipoproteins in human and experimental atherosclerosis.*

THE effect of heparin on lipoproteins has been observed in normal and atherosclerotic subjects during fast and after a standard fat meal. In regard to plasma turbidity, heparin clarifying effect is

...cts than in normal ones. The
... protamine sulphate has been

The effect of heparin on normal plasma after a fat meal and on the plasma of atherosclerotic patients during fast has proved, by means of paper electrophoresis, to consist of a displacement of lipids from lipoproteins α to β lipoproteins, with a consequent normalisation of the lipoproteic pattern and of β/α ratio. An increase in the speed of migration of some protein and lipoprotein fractions as a result of heparin has been noticed. The plasmatic ...

... be broken by the action of heparin which favours the conversion of lipids from β into α lipoproteins, thus normalising the β/α ratio.

Heparin daily administered to rabbits reduces humoral alteration induced by cholesterol diet, and therefore prevents vascular lesions in experimental atherosclerosis. It also diminishes the higher values of all lipidic fractions and normalises lipoprotein derangement by ... sis) a large proportion

... ost significant results
... sidering the β/α ratio as an index of lipoprotein derangement obtained by a prolonged cholesterol feeding. The action of protamine sulphate on serum lipoproteins is the opposite to that of heparin.

However, it produces no greater anatomical alterations than in the controls treated only with cholesterol, although it can slightly reduce the amount of heparin normally present in the plasma of rabbits.

VERZÁR, F., and FLÜCKIGER, E., Basle. *Lack of adaptation to low oxygen pressure in aged animals.*

ADAPTATION to a barometric pressure of about half an atmosphere, or the equivalent low partial oxygen pressure, necessitates various adjustments in the animal body. Respiration and circulation, as well as erythrocyte and hæmoglobin production, are changed.

We (1) found it to be a very characteristic phenomenon that, in rats, after lowering the atmospheric pressure to 350 mm. Hg (6,500 m. simulated altitude) the rectal temperature drops several degrees in a few hours. In about four to five days body temperature is restored to normal, although the pressure was kept low. It was also demonstrated (2) that rats kept at 350 mm. Hg for a fortnight developed a status which we called "retained adaptation," *i.e.*, if these animals were brought to atmospheric pressure (732 mm. Hg at Basle) and within a few days returned to 350 mm. Hg, only a

slight decrease in rectal temperature was observed. At 732 mm. Hg this status of retained adaptation slowly returned to the full reaction until, ten days later when exposed to 350 mm. Hg, the same drop of rectal temperature was seen as originally.

This drop of temperature and its restoration to normal is an objective sign of adaptation which can easily be observed. We have used this phenomenon in the present publication to study whether this adaptation to low pressure is the same in young, adult, and aged animals.

Methods—The technique of these experiments was similar to that used in our earlier studies (1). The white male rats of our laboratory stock were fed with a standard diet *ad lib.* They were placed in a tank of about 125 litres capacity in which the pressure was diminished to 350 mm. Hg and kept constant at about ±10 mm. Hg. At 350 mm. Hg there is an air flow through the tank of about 4·5 litres per min. The temperature within the tank was about 22° C. During the first twenty-four hours the tank was opened several times in order to observe the drop in rectal temperature. During the next days the tank was only opened once daily, the animals taken out for about twenty minutes, and their rectal temperature measured with a mercury thermometer This was done regularly at about 10 to 11 A.M., twenty-four hours after the last feeding. Afterwards the rats were placed back into the tank, with fresh food and water. The tank was equipped with a window allowing observation of the behaviour of the rats. The weight of the animals was taken at regular intervals, and in several series also the blood hæmoglobin was measured by the Sahli method.

Results—We used male rats, 40 to 600 days old, in groups of four animals of the same age. The results of our experiments are tabulated as mean values for each group in Table I. There are always individual differences in each group. The drop of body temperature and the time in which normal body temperature is restored should be compared. Examples of temperature curves of different age groups are shown in Figs. 1 and 2.

Sixteen groups each of four animals have been studied. Of these, two groups were tested more than once. one group was studied when 2½ and 4½ months (70 and 135 days) old (exp. 74B and 79B), and one group was tested at the age of 12, 14, and 20 months (360, 420, 600 days) (exp. 74A, 79A, and 85A).

"Retained adaptation" was tested in thirteen of the sixteen groups. This was done in the following way: After a period of about fourteen days of adaptation to 350 mm. Hg, the rats were kept at 730 mm. Hg for forty-eight hours and then exposed again to 350 mm. Hg. Since retained adaptation never lasts longer than about a fortnight, there is no danger that the reaction at a later trial was influenced by the first exposure to low barometric pressure. However, the results in these groups were checked with the other groups which were only used once.

Thus, in the course of ageing, the rats lose the ability to restore normal body temperature at low oxygen pressures.

"Retained adaptation," *i.e.*, the reaction to 350 mm. Hg of formerly adapted rats after two to three days of a pressure of 730 mm. Hg to a new decreased pressure of 350 mm. Hg, was also different in old animals. The oldest groups (79A, 89, 85A) showed

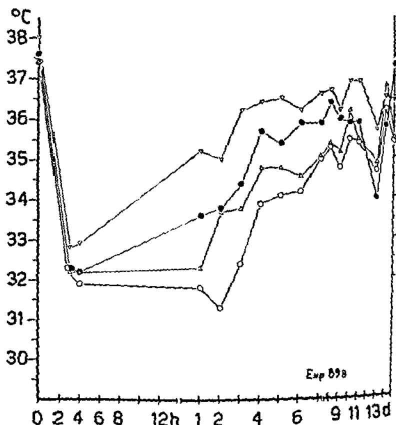


Fig. 2

Series 89B. Four male rats, 19 months old. Incomplete adaptation to 350 mm. Hg.

the largest drop in body temperature, as much as without a previous adaptation. More characteristic is that while the young animals restored body temperature within one to two days (*Fig.* 3), in the rats of 14, 19, and 20 months of age there was no return to normal body temperature, even after the third day of exposure to low barometric pressure (Fig. 4). Some of the old animals died after exposure to low atmospheric pressure, which never occurred with young animals.

It is known that exposure to low barometric pressure, especially during the first few days, results in a decrease of body weight, or inhibits growth in young animals through a decrease of food intake (3) and the body water content (4). Data relating to body weight are given in Table II.

In order to characterise the influence of low barometric pressure

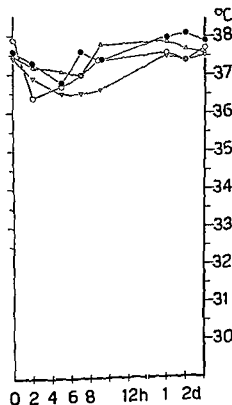


Fig. 3

Retained adaptation of the same animals as in Fig. 1 after forty-eight hours at 730 mm. Hg and then again at 350 mm. Hg.

on the different age groups by another criterion, the hæmoglobin of the blood from the tip of the tail was determined in several series. In rats of two months old the hæmoglobin changes were followed during the first five days by daily determinations (Group 83B). It was fo ... started only on the fifth day of ... on the tenth day (100 ...). In Table III

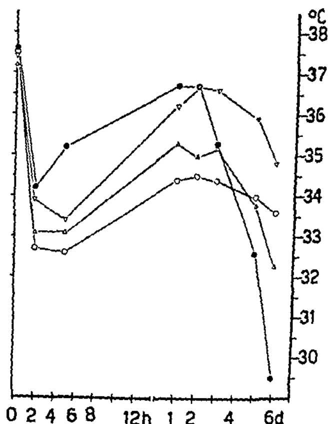


FIG. 4

Retained adaptation of the same animals as in Fig. 2 after *forty-eight* hours at 730 mm. Hg and then again at 350 mm. Hg.

TABLE II

CHANGES IN WEIGHT OF MALE RATS OF DIFFERENT AGE EXPOSED TO LOW OXYGEN PRESSURE

Series.	Age and Number of Male Animals.	Mean Initial Weight, G.	Days at 350 mm. Hg.	Mean Weight, G.	Difference, G
83B	2 months (4)	98	10	102	+ 4
88	2 months (4)	89	17	94	+ 5
91	9 weeks (4)	115	15	108	− 7
80	7 months (4)	216	10	212	− 4
83A	14 months (4)	334	10	309	−25
89	19 months (4)	289	17	275	−14

hæmoglobin values estimated after different periods of exposure to 250 mm. Hg are shown. The mean hæmoglobin content at 732 mm. Hg of fourteen rats of 2 to 14 months old was found to

TABLE III

CHANGES IN MEAN BLOOD HÆMOGLOBIN IN MALE RATS OF DIFFERENT AGE, EXPOSED TO LOW OXYGEN PRESSURE

Series.	Age and Number of Animals	Days at 350 mm. Hg	Mean Hæmoglobin Percentage (=16 g per cent)	Lowest and Highest Value	Remarks
Controls	2 to 14 months (14)		106	99 to 115	At 730 mm. Hg
83B	2 months (4)	10	137	125 to 145	
81	9 weeks (4)	10			
70	3½ months (4)	14	166	146 to 180	
83A	14 months (4)	10	158	150 to 166	
85A	20 months (4)	11	149	146 to 152	

be 106 per cent. (99 to 115, when 100 per cent. = 16 g. hæmoglobin per 100 ml.). From the table it follows that the capacity of the rats to increase the blood hæmoglobin did not diminish up to 20 months of age (Table III).

DISCUSSION

It is not definitely known what causes the drop of body tempera-

the metabolism which is necessary for normal heat production is increased. In aged animals, however, this increase in metabolic activity to restore and maintain normal body temperature, *i.e.*, their adaptation capacity, is diminished; they are also barely able to reach a state of adaptation which can be retained when kept at 732 mm. Hg.

This inability to adapt to low oxygen pressure is an astonishingly early sign of ageing. It is, so far, the only example of functional adaptation which disappears with age that we were able to observe.

decrease of
rats becomes

SUMMARY

1. Adaptation to low barometric pressure (350 mm. Hg) was studied in sixty-four male rats between the ages of 45 to 570 days (2 to 20 months).

2. Adaptation was tested by the decrease and the restoration of body temperature during fifteen days' continuous exposure to a low atmospheric pressure of 350 mm. Hg. In addition, "retained adaptation" was also tested after an additional stay of forty-eight hours at normal barometric pressure (732 mm. Hg at Basle).

3. Fourteen to 20 months old rats are completely unable to restore the normal body temperature after the initial drop during the first few hours of exposure to low barometric pressure. They also show a decreased "retained adaptation." This is in contrast with the findings in young animals.

4. There is no significant difference in the increase of blood hæmoglobin between young and old rats in response to a ten to fifteen days' exposure to 350 mm. Hg.

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CHAPTER XIII

CLINICAL PROBLEMS

ANDERSON, W. F., Glasgow. *A clinical study of the patients attending a consultative health centre for old people at Rutherglen, Scotland.*

MEASURES for the promotion of health and the prevention of disease in older people lack co-ordination and are incomplete. Thus it was decided to start a Consultative Health Centre in Rutherglen for people over the age of 54 years.

The functions of the Consultative Health Centre are:—

1. To act as a source for the spread of information relating to the promotion of health and the prevention of disease.
2. To compile a register of the elderly living within the district.
3. To examine healthy old people at routine intervals and to wage a search for early and unsuspected disease.
4. To integrate treatment with the social environment through care and after-care work.
5. To reduce the demand on hospital beds to a minimum.
6. To provide a citizens' advice bureau for old people.
7. To carry out research into the ageing process.

This centre was started by Dr Nairn R. Cowan, the Medical Officer of Health, Rutherglen, in March 1952. The basic idea was to integrate available services for old people in an endeavour to keep them in a sound state of physical, mental, and social well-being. Rutherglen was an ideal site for this experiment as it is a very densely populated area (25,000 population in 1,046 acres) with a centrally placed well-equipped Health Authority Clinic.

After consultation with the local general practitioners, with the Western Regional Hospital Board, and with the local Old People's Welfare Committee, a co-ordinated team was developed comprising the Medical Officer of Health, a consultant physician, his resident medical officer, health visitors, members of the Old People's Welfare Committee, a welfare officer of the burgh, a physiotherapist, and a chiropodist. General practitioners were advised, if they so desired, to recommend healthy old people or old people with minor complaints to attend this Centre.

The Medical Officer of Health holds four clinic sessions in the earlier part of each week, during which he sees new cases and is available to see any patient previously examined who cares to return for advice. He carries out general clinical and medico-social assessments and, as he is also the local chest physician, he can without difficulty arrange for routine X-rays of chest. The consultant physician conducts a clinic session each Friday morning, and he examines the new cases seen in the earlier part of the week by the Medical Officer of Health and cases returning for continued supervision. All the cases are sent to the Centre with a letter from their general practitioners, who receive complete information about their patients in a letter dictated and signed by the consultant physician.

These letters incorporate the combined opinions of the consultant physician and the Medical Officer of Health.

Findings—From August 1952 until June 1954, 400 old people were seen at the centre. Their ages, sex, and marital status are shown:—

AGE, SEX, AND MARITAL STATUS
(400 cases)

Age Group.	Male.			Female.			Total.	
	M.	W.	S.	M.	W.	S.	M	F.
55 to 59 .	5	...	1	8	3		6	11
60 to 64 .	9	2	2	15	11	7	13	33
65 to 69 .	30	11	1	26	20	11	42	57
70 to 74 .	35	15	3	13	21	5	53	39
75 to 79 .	29	22	4	9	26	4	55	39
80 to 84 .	8	16	2	3	7	4	26	14
85 to 89 .	...	6	.		4		6	4
90 and over	..	2					2	..
	116	74	13	74	92	31	203	197

M.=Married. W.=Widow or widower. S.=Single

Two hundred and three subjects were men and 197 women, while 238 were 70 years and over. Of these 400, 106 had no complaint and their age and sex is shown below:—

NO COMPLAINTS
(Out of the 400, 106 had no complaint.)

Age Group.	Male.	Female	Total.
55 to 59 . .	2	1	3
60 to 64 . .	2	4	6
65 to 69 . .	6	12	18
70 to 74 . .	22	5	27
75 to 79 . .	19	10	29
80 to 84 .	16	4	20
85 to 89 . .	..	3	3
90 and over .	..	...	...
	67	39	106

Sixty-seven were males and thirty-nine females; seventy-nine of these were 70 years and over. All these old people were able to come to the clinic and were from all classes of society.

The next table shows the complaints elicited from the total group of 400.

COMPLAINTS

	Male.	Female.	Total.
Pain in chest	10	7	17
Pain in neck	...	7	7
Pain in back	6	5	11
Pain in joints	22	35	57
Pain in limbs	15	11	26
Pain in abdomen	5	6	11
Pain in feet	6	1	7
No complaints	67	39	106
Breathlessness on exertion	28	26	54
Weakness—			
General	14	29	43
Limbs	4	4	8
Giddiness	12	12	24
Cough with expectoration	4	4	8
Sleeplessness	3	2	5
Nervousness	..	4	4
Frequency of micturition	2	2	4
Blood in sputum	2	...	2
Itch	2	...	2
Shakiness	..	1	1
Numbness of hands	..	1	1
Tickling sensation in throat	1	..	1
Choking sensation in throat	...	1	1
	203	197	400

Pain in various sites was the commonest complaint, followed by breathlessness on exertion, weakness, and giddiness.

The general nutrition of these old people was noted and a clinical estimation of the presence or absence of obesity made. Their height and weight was taken and percentage overweight to ideal weight was reckoned according to Anderson's nomogram.

PERCENTAGE OVERWEIGHT TO IDEAL WEIGHT
(According to Anderson's nomogram.)

Age Group.	Normal and Less.		1 to 19 per Cent.		20 to 49 per Cent.		50 to 79 per Cent.		80 per Cent. and Over.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
55 to 74	69	48	35	41	10	37	0	10	0	4
75 and over	60	26	19	20	10	8	0	2	0	1
Totals	129	74	54	61	20	45	0	12	0	5

It will be noted that there are no males 50 per cent. or more overweight, while there are seventeen females; in addition, in the 20 to 49 per cent. overweight group there are more than twice as

many females as males (9·8 per cent. males and 21·8 per cent. females). The percentage overweight of the cases with no complaint showed only three females 30 per cent. or more overweight. No one was 50 per cent. overweight; the great majority were 1 to 9 per cent. overweight or, indeed, underweight.

ADIPOSITY
(106 cases—no complaints.)

Age Group.	Normal and Less.		1 to 9 per Cent.		10 to 19 per Cent.		20 to 29 per Cent.		30 to 39 per Cent.		40 per Cent. and Over.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
55 to 64	3	1	..	2	1	2	...			..		..
65 to 74	14	6	11	1	2	6	..	3	..	..	.	1
75 to 84	24	6	4	4	5	2	3	. .	.	1	.	1
85 to 89	...	1		1		1					.	..
Totals	41	14	15	8	8	11	3	3		1	.	2

The clinical diagnoses are shown, and the most frequent one was benign hypertension, followed by microcytic hypochromic anæmia and osteoarthritis.

DIAGNOSES

	Male	Female.	Total.
Blood-pressure of 140/90 or over			
[illegible]	62	47	109
[illegible]	28	49	77
[illegible]	5	3	8
[illegible]	14	18	32
[illegible]	15	16	31
Fibrositis	3	24	27
Chronic bronchitis	18	4	22
[illegible]	11	4	15
[illegible]	5	4	9
[illegible]	10	...	10
[illegible]	1	3	4
2. Arteriosclerotic	2	1	3
3. Syphilitic	1	...	1
Diabetes mellitus	2	3	5
Pernicious anæmia	1	2	3
Angina pectoris	1	2	3
Miscellaneous	24	17	41
	203	197	400

Blood-pressure readings in elderly people are under review at present, and Hamilton *et al.* (1954) have been providing valuable evidence on the range at all ages.

The next table shows some of the previously held ideas about blood-pressure in the older age groups :—

Age Group.	Blood-pressure.
60 and over	. 135·2/86·9 (Symonds, 1922, quoted by [illegible]
60 to 64	[illegible]

The systolic pressures of the 400 people are shown :—

SYSTOLIC PRESSURE
(400 cases according to age and sex.)

Age Group	Under 140.		140 to 170.		171 to 201.		202 and Over.		Total.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
55 to 74 .	7	5	49	34	30	45	28	56	114	140
75 and over .	3	...	32	9	28	23	26	25	89	57
	10	5	81	43	58	68	54	81	203	197

One hundred and twelve males and 149 females had a systolic pressure of over 170 mm. of mercury. Twenty-six males and forty-four females had a diastolic pressure of over 110 mm. of mercury.

DIASTOLIC PRESSURE
(400 cases according to age and sex.)

Age Group.	Under 90.		90 to 109.		110 to 129.		130 and Over.		Total.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
55 to 74 .	51	35	49	69	10	32	4	4	114	140
75 and over .	33	11	44	38	9	7	3	1	89	57
	84	46	93	107	19	39	7	5	203	197

Of the subjects with no complaint, thirty-seven males and twenty-nine females had a systolic pressure of over 170, and nine males and four females a diastolic pressure of over 110.

SYSTOLIC BLOOD-PRESSURE
(106 subjects with no complaint.)

Age Group.	109 to 139.		140 to 170.		171 to 201.		202 and Over.	
	M.	F.	M.	F.	M.	F.	M.	F.
55 to 74 .	3	3	14	4	6	10	9	5
75 and over	1	...	12	3	12	7	10	7
Totals .	4	3	26	7	18	17	19	12

DIASTOLIC BLOOD-PRESSURE
(106 subjects with no complaint.)

Age Group.	Under 90 mm.		90 to 109.		110 to 129		130 and Over.	
	M.	F.	M.	F.	M.	F.	M.	F.
55 to 74 .	11	8	18	12	1	2	2	
75 and over	14	4	15	11	5	2	1	.
	25	12	33	23	6	4	3	.

The abdominal reflexes were next studied and related to the percentage overweight.

ABDOMINAL REFLEXES
(400 cases excluding six subjects with disease of central nervous system.)
Figures are expressed as a percentage of the relevant age group.

	Age Group.	Nine per Cent. Overweight and Less.	Ten per Cent Overweight and Over.
		Per cent.	Per cent.
Present .	55 to 74 75 and over	34·4 29·1	10·0 6·3
Absent .	55 to 74 75 and over	28·8 43·1	26·8 21·5

In the 55 to 74 .
in 44·4 per cent. of
75 and over age grc ,

same age group only 6·3 per cent. of those 10 per cent. or more overweight had present abdominal reflexes.

Tendon reflexes were only occasionally absent, and the results are shown in the next table.

TENDON REFLEXES

(400 cases (203 males and 197 females) excluding six cases with disease of the central nervous system.)

	Males (199 cases).			
	Absent.	Diminished.	Present.	Exaggerated.
Biceps . .	...	30	163	6
Triceps .	...	34	161	4
Supinator	4	30	159	6
Knee . .	9	36	134	20
Ankle . .	15	68	113	3

	Females (195 cases).			
	Absent.	Diminished.	Present.	Exaggerated.
Biceps .	.	24	166	5
Triceps .	1	27	163	4
Supinator	3	27	160	5
Knee . .	3	41	145	6
Ankle .	4	67	123	1

[illegible] per cent., and 318 [illegible] re. [illegible] admitted to hospital, primarily for further investigation.

SUMMARY

The function, a description, and the number of people seen at the Rutherglen Centre has been reported. The cases have been reviewed regarding their complaints, diagnoses, nutrition, blood-pressure, abdominal and tendon reflexes. Reference has been made to their hæmoglobin estimation.

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FRAENKEL, MARTA, New York. *Hospital care needed by aged people.*

HEALTH and medical care services are a major concern in our care for the aged. The challenge to medicine may be summarised in a recent remark of Dr Leonard W. Scheele, Surgeon-General of the U.S. Public Health Service: "Physicians undoubtedly will be able to deal more effectively with many of the disabilities of old age. Nevertheless, the disabilities must be dealt with in patients whose numbers will increase."

In the planning of medical care for the aged on the community level [illegible]

[illegible] information on medical care needs of the aged has to be current, since the needs are subject to continual changes. Type and volume of medical care for patients with certain diseases varies with the progress in their treatment. The radical changes since the introduction of antibiotics and the extension of surgery to aged people are well-known illustrations. The need of aged persons for care in hospitals, furthermore, is influenced by the availability of extra-hospital services and of programmes in which hospital and extra-hospital services are integrated. Extensive development of medical care institutions other than hospitals, such as nursing-homes, infirmaries, and convalescent homes, should be mentioned here. Moreover, extra-institutional services such as home-maker and visiting nurse programmes make it possible for many aged persons with chronic [illegible]

I w [illegible] people.

The [illegible] by the New York City Departments of Hospitals and Health and Russell Sage Foundation during a six-month period in 1952. The study covered a total of 122,000 patients discharged from the municipal hospitals in New York City.

The municipal hospitals care primarily for indigent and "medically indigent" sick residents of New York City. The city's population typically reflects the trend toward ageing. The 1950 United States population census revealed approximately 605,000 people of 65 years and over—that means, 8 per cent. of the city's then nearly 7·9 million as against 5·6 per cent. of the city's nearly 7·5 million in the preceding census of 1940. Of these 605,000 people, 73·5 per cent. were between 65 and 74 years of age, 23 per cent. between 75 and [illegible]

([illegible]
the s [illegible]
10·2 [illegible]
and [illegible]

the municipal general hospitals during one month, January 1954, we found 18·2 per cent. to be aged. Among the discharges from the medical services of these hospitals the proportion was as high as 35·3 per cent. This proportion differed considerably among the fourteen general hospitals, mainly according to the demographic characteristics of the neighbourhood. It ranged from 25 to 50 per cent.; one out of two of the patients discharged from the medical service of one of the general hospitals was aged.) Over 55 per cent. of the aged patients were male, a fact that does not correspond to the age-sex composition of New York City's population at large; according to the 1950 census, only 45·5 per cent. of the aged were male. A combination of factors, including different morbidity in the two sex groups as well as socio-economic elements, probably contributed toward the excess of aged male patients in municipal hospitals.

In evaluating the figure of 16 per cent. of aged among the total hospital discharges, it should be kept in mind that these data originate from tax-supported hospitals. It seems safe to assume—though corresponding data to support such assumption are not immediately available—that the proportion of aged people is higher in the tax-supported hospitals than in the other categories of hospitals, partly because medical indigency is more frequent in old age than during the years of earning capacity.

The nearly 20,000 (19,676) aged persons covered by our study were found to be hospitalised for a wide variety of diseases. A few conditions are specific for old age and some others are particularly significant in the hospital morbidity of the aged, be it due to frequency of occurrence or to seriousness, or to both. As is to be expected, over 80 per cent. of the hospital patients with the diagnoses of general arteriosclerosis and of senile psychosis were aged. But, aged persons also accounted for 40 per cent. of the patients with malignant neoplasm, 30 per cent. of those with diabetes mellitus, 30 per cent. of those with cholecystitis, and 25 per cent. of those with hernia.

If one asks what role various diseases play in the hospital morbidity of the aged, arteriosclerotic and degenerative heart diseases emerge as the most important conditions; they accounted for nearly 13 per cent. of all the discharges of aged hospital patients. Next in numerical importance are malignant neoplasms of various sites, which accounted for slightly over 10 per cent. Five conditions, namely arteriosclerotic and degenerative heart disease, malignant neoplasm, senile and cerebral arteriosclerotic psychosis, vascular lesions affecting the central nervous system, and hypertensive disease were reported as the discharge diagnoses of nearly 47 per cent. of all aged patients.

Surgery has, as you know, been steadily extended to persons of advanced age, parallel with progress in anæsthesia and in antibiotic treatment. Such surgery is no longer limited to life-saving interventions. Increasingly, aged persons request and successfully undergo operations which relieve them from pain and limitation of

activities, from the need for strict diets and other inconveniences
and thus contribute
old age. Fifty-six p
hernia (*without* ob
cholelithiasis underwent surgery.

Next to the frequency of need for hospitalisation, the length of

medical care, including long-stay hospitalisation. Old age, it has often been assumed, may slow down healing and recuperative processes. Moreover, multiplicity of diseases is one of the characteristics of morbidity of the aged. For instance, simultaneous occurrence of arteriosclerosis and diabetes mellitus or a prostate

different age groups.

Of the total 122,000 hospital discharges covered in our study, 14 per cent. stayed in the hospital longer than one month. The proportion for the aged was 24 per cent. as against 12 per cent. for patients in the other age groups.

A comparison of the length of stay of aged and other patients, hospitalised for the same disease, shows for some conditions that no marked differences occur; for instance, 64 per cent. of all cancer patients, of the aged and the others alike, were discharged within one month. But hypertensive disease and diabetes mellitus, for instance, showed considerably longer hospital stays for aged than for other patients.

Attention should be called to the high proportion of patients, including aged patients, with various chronic diseases, particularly those of the cardiovascular system, who stayed in the hospital for very short durations. One out of three of the aged patients with arteriosclerotic
ditions
for con
these patients was continued on the so-called home care services.

The municipal general hospitals in New York City operate, in addition to wards and clinics, extra-mural services—the home care services, in which certain phases of care are rendered to patients no longer sufficiently incapacitated to require the whole armamentarium of a hospital ward but too sick or disabled to attend a clinic. Patients who do not have a private physician, and whose home seems an adequate milieu for care, are discharged to the home care service
to wha
care p
hospit
visiting nurses, etc. It seems most important that, when necessary, the patient can promptly be returned to the hospital ward. Acute

exacerbations of chronic conditions are the main reasons for such returns.

Though the home care programmes were planned for patients of all ages, experience has shown that the service is used heavily for aged patients. They account for 45 per cent., and sometimes more, of the home-care census. Cardiovascular conditions are most frequent among the aged patients on home care. Each of the general hospitals now has a number of aged patients on its roster who have repeatedly been transferred back and forth between the ward and home care. They enjoy, during many weeks and months of quiescence of their chronic condition, the privacy of their own home with the benefit of medical supervision and necessary ancillary care; during acute attacks they are returned to the hospital for stays of limited duration, maybe of only a few days.

We thus see that in the era of antibiotics on the one hand and of a rapidly ageing population on the other, the challenges of the "acute" hospitals have changed basically. The acute diseases of yesteryear, scarlet fever and diphtheria, pneumonia, mastoiditis, etc., have been replaced by a new group of "acute" conditions—the acute exacerbations of chronic diseases, especially of our aged citizens.

Planning for hospital care has to be based on sound estimates of future needs. This applies particularly to the *terra nova* of extensive hospital care programmes for a rapidly ageing population. Analysis of the hospital services rendered at present to aged people is the most reliable basis for estimates for the future. Current [illegible] medical care [illegible] ose [illegible] es.

Our British colleagues have pioneered in the area of [illegible] ity and medical care statistics, primarily by studies conducted by the Registrar General's office. The pilot project, from which the data in this paper were abstracted, will, we hope, pave the way for a scheme of current hospital morbidity reporting in New York City.

ECKERSTRÖM, S., Gothenburg. *The problem of urinary incontinence in old age.*

[illegible] old aged people was dis- [illegible] riatric [illegible] years. [illegible] l from [illegible] h case. [illegible] lesions in the central nervous system. The common principles of the care of the incontinent patient in the clinic were outlined.

The disturbance in the nervous control of the mechanism of

micturition was discussed. This disturbance must be seen as a background to the spastic bladder. The general principles of the internal therapy with different drugs were described and the danger of long bed-rest was emphasised.

A series of cystometric examinations was discussed, including

methods.

OLBRICH, O., and WEBSTER, D., Sunderland. *Renal function in prostatism.*

RENAL function was investigated in patients suffering from prostatism. and the cases are divided into five groups:—

1. (*a*) Patients with prostatism without urinary infection (not operated).
   (*b*) Patients with prostatism and urinary infection (not operated).
   (*c*) Patients with prostatism without urinary infection, pre-operatively and post-operatively.
   (*d*) Patients with prostatism with infection, pre-operatively and post-operatively.
   (*e*) Patients with acute retention.

Patients with high diastolic blood-pressure have been excluded from the study in all groups.

2. Aged males with enlarged prostates but no infection show a ... of glomerular filtration,

ular function.

4. Improvements in renal blood flow and tubular function occur, after operation in the non-infected group.

5. In acute retention there is an arrest of tubular function which returns after decompression.

6. The discrete renal functions of prostatic groups have been compared with normal young and aged patients with normal diastolic blood-pressure without prostatic disease.

7. The influence of "age" has been compared with the influence of "disease" on renal function.

DISCUSSION

DR O. TAYLOR BROWN: "What is the author's regime in acute retention?"

DR OLBRICH: "Immediate operation, and if that is impossible, a catheter. This applies particularly to cases where

there is infection. Where necessary, urine for examination can always be obtained by puncture."

CORDONNIER, J. J., St Louis. *Total cystectomy and management of carcinoma of the urinary bladder.*

MANAGEMENT of carcinoma of the urinary bladder presents one of the most difficult problems in genito-urinary surgery. Non-invasive, grade 1 papillary carcinoma responds readily to transurethral resection or electrocoagulation. The grades 3 and 4 invasive sessile tumours present an almost hopeless problem. Progress may be most anticipated in the group of grade 2 moderately advanced papillary carcinomas with some degree of muscle invasion, but without extension beyond the bladder wall and without metastases. This group constitutes the major portion of all bladder carcinomas.

Over six years ago we introduced a new method of ureterosigmoid anastomosis, eliminating the submucous tunnel and substituting a direct end-to-side anastomosis, approximating mucosa to mucosa, thereby permitting a more radical approach to lesions which were somewhat less advanced than those previously reserved for cystectomy. More recently, the use of an isolated segment of ileum for bladder substitution (Bricker, 1950) has been adopted in place of ureterosigmoidostomy.

One hundred and eleven patients are included in our series, with an operative mortality of 4·6 per cent. Only six were under age 50, and the oldest was 78, with an average age of 62. Seventy of the patients were treated by cystectomy plus ureterosigmoidostomy, fifteen with ileal bladder substitution, and in twenty-six cases urinary diversion alone was performed. There was an overall survival rate of 18·2 per cent. in the group operated on more than five years previously, and of 50 per cent. in the group of three to five years after operation. This survival rate is considered satisfactory, having regard to the fact that all cases had been fairly advanced at the time of surgery, with either rapid recurrence of grade 2 lesions, deep muscle penetration, or with grade 3 and 4 lesions when discovered. Urinary and fæcal leakage has occurred in only four patients.

Late results have shown an incidence of pyelonephritis in 50 per cent., but in most instances the attacks have been mild. Hyperchloræmic acidosis, present in about 73 per cent., has been the principal late complication, but has been controllable by the usual means; the fairly high incidence of urinary sepsis—controllable by chemotherapy—has been improved by the use of the isolated ileal segment introduced by Bricker. Our experience with this procedure has been completely satisfactory and adds new hope in the future management of carcinoma of the urinary bladder.

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KRAG, C. L., Washington, D.C. *The community health aspects of diabetes mellitus among older people.**

DIABETES mellitus is one of the chronic diseases which is attracting the interest of an increasing : and of organisations in the Un disease which most commonly ' some interest at this Congress to present a general review of the activities and methods used by various organisations in the United States attempting to meet some of

The esse those who c

that has been recognised for many centuries, yet the cause is still unknown. Since the discovery of insulin three decades ago, many thousands of lives have been saved that would otherwise have been lost from acidosis and coma. Yet, this dramatic, life-saving hormone does not cure the patient, it only alleviates one phase of the disease.

The complications from diabetes are many and include such diseases as cataracts, retinitis, neuritis, and atherosclerosis. The end result of these are blindness, paralysis, loss of the extremities from gangrene

...ious community resources devoted to the care of the chronically ill

; possible, it is believed that a nber of persons in the United States

...gular medical supervision. It has also been shown that the prevalence of diabetes mellitus increases markedly with age (6). Because of the continuous increase of the number and percentage of older people in the general population, the total number of cases of diabetes is expected to increase in the future, until such time as an effective

I com in t treatment requires that the blood sugar must be maintained at normal levels

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* The opinions expressed are those of the author and are not necessarily those of the Public Health Service or the U.S. Department of Health, Education, and Welfare.

patient must also share much of the responsibility for supervising his diet, regulating his activity, and adjusting the dose of insulin according to changes in the blood and urine sugar. *Only* a co-operative and intelligent patient, properly educated in the fundamentals of diabetes, and an experienced physician can carry out such a regimen successfully.

Summarising, one may express these points of view by stating that severe and progressive disability and premature death from diabetes mellitus and its many complications will occur (*a*) if the patient does not know that he has diabetes, (*b*) if he fails to seek continued medical supervision once he knows of his illness, (*c*) if he does not have the proper knowledge or ability to regulate his diet, physical activity, or administer insulin, or (*d*) if the physician who cares

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also to the community. For this reason voluntary associations—such as the American Diabetes Association, as well as official health organisations such as the United States Public Health Service and various state and local health departments, have established special programmes during the past few years. These programmes are concerned with such matters as the detection of undiagnosed cases of diabetes; returning to medical care those who have strayed away from it; the development of educational programmes for patients and their families and the community at large; and providing educational programmes for physicians, nurses, dietitians, and laboratory technicians.

The first of these—detection of the undiagnosed cases of diabetes—has been of particular interest. Several approaches have been used in attempting to detect these cases. The traditional and most important case-finding method is the proper examination of patients when they are admitted to a hospital or visit a physician's office. Although the laboratory procedures employed might well include a glucose-tolerance test, a screening procedure which will rule out hyperglycæmia or glycosuria is commonly used and is to be preferred in most instances.

Because patients with diabetes may, while in the fasting state, have a normal blood sugar and no glycosuria, the specimens are collected from the subject while in the non-fasting state. *Many*

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individual physician or by the hospital, and that some kind of community action is required before this group of individuals can be reached.

Attempts to reach this latter group have followed several patterns.

1. **Publicity campaigns**—Special programmes have been carried out by use of mass communication methods which are directed towards the entire community. Special radio and television programmes, stories, and articles in newspapers and magazines, special announcements on the radio and at movie theatres, display posters in store windows, and lectures and talks by physicians and nurses before lay groups of people have all been used. For several years now the American Diabetes Association has carried on an aggressive one-week-long campaign each November, known as "Diabetes Week." Its purpose is to acquaint the public with the facts of [illegible]

[illegible] necessary information and materials to carry on a local programme. In some communities these local chapters have also carried out a mass screening programme during this one week.

2. **Development of routine health examinations**—To an increasing extent more well people are being examined periodically. For some it is done routinely as a part of their employment. Many establishments employing large numbers of people routinely examine all new employees. In many instances they also examine all employees at regular intervals. Other organisations such as private and public clinics are also offering periodic health examinations (3). Many [illegible] have shown increased

[illegible] improving their techniques so as to carry out a [illegible] screening procedure and referral and follow-up programme.

3. ***Mass screening programmes* for diabetes**—The availability of several new laboratory procedures and special equipment has made possible the development of mass case-finding programmes. For example, the Wilkerson-Heftman blood-sugar screening method, carried out with the Hewson Clinitron machine, can process 180 [illegible] hour and requires the services of only one [illegible]

[illegible] operation and the small size [illegible] programmes. This [illegible]

[illegible] also in use. Some of these are [illegible]

methods which have been adapted to a screening method. Two of these make use of dyes, such as the modified picric acid method or the anthrone method (2). This latter method has had a rather extensive use in one state as a part of a previously existing blood sample collection programme for the control of syphilis. A portion of the venous blood sample was used for the processing of the diabetes screening programme, and almost half a million persons in one state were screened for diabetes by this method (9).

A number of case-finding programmes for diabetes have been carried out by means of urine tests (1, 4, 8). In addition to the well-known qualitative Benedicts method, special reagent tablets and powders have also been employed. These products, sold under the proprietary names of Galatest and Clinitest, have been rather widely used in the United States. The first of these is used by placing a few drops of urine on the powder and noting the colour changes. The second one is used by adding eight drops of urine to some water in a test tube, adding the tablet and noting the change in colour. Both of these methods are suitable for mass testing programmes.

Except in special facilities such as hospitals, ambulatory clinics, or physicians' offices, urine testing programmes are rather difficult to carry out because of the need to examine fresh urine. Some community programmes have carried out a mass case-finding programme in which the subjects bring in urine samples to drug stores, which in turn either test the urine or forward it on to a central laboratory. To eliminate some of the difficulties encountered by this type of programme, one method has been devised to eliminate the need for containers of fresh urine. A kit known as the Dreypak contains a small piece of filter paper impregnated with sodium fluoride as a preservative. The subject allows a few drops of urine to be absorbed by the paper which is subsequently processed at a central laboratory by dipping it into boiling Benedicts reagent (8). The colours usually seen with the Benedicts method will appear upon the paper.

Until more experience has been obtained, it will not be possible to state with certainty which of the various laboratory tests currently available is best. It is clear, however, that the circumstances determining the availability of the subjects to be tested will largely determine which of the methods should be used.

Those who have had some experience with community case-finding programmes usually emphasise the need for a well-planned and organised programme for the referral and follow-up of suspected cases of diabetes. Unless such a programme is followed, some of the individuals with diabetes, through a misunderstanding or for other reasons, will not obtain the care of a physician. In addition, the final results of the screening programme will be unknown. For these reasons individuals with a positive screening test are referred to the physician or clinic of their choice for a more detailed and adequate evaluation of their case and treatment if needed. Subsequently,

follow-up inquiries are made to determine if the individual did see a physician and, if so, what the results of the evaluation were. The follow-up phase of the screening programme usually requires a central record system and staff and some provision to visit individuals in their own home when they fail to answer routine [illegible]
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in some [illegible]
society a[illegible]
nurse in such cases has been particularly helpful in meeting with recalcitrant individuals in their own homes and encouraging them to seek the care that they need.

The results of some of the diabetes screening programmes have been published. The results of these and the unpublished programmes are being compiled for study and future publication. In general it may be stated that approximately one million people have now been screened by some fifty different special screening programmes. The results indicate that several thousand new cases of diabetes have been discovered because of these programmes (10).

Educational programmes—In most instances patients with diabetes learn the fundamentals of this disease from a discussion with their physician and by reading one or more books on the subject. To an increasing extent physicians are now depending upon a nurse to teach the patient some of the details of insulin administration and of body hygiene, and upon a dietitian to teach the fundamentals of the selection and measurement of the diet which has been prescribed by the physician. Through the joint planning of the American Diabetes Association, the American Dietetic Association, and the United States Public Health Service, special educational materials have been prepared. A series of film strips with appropriate sound tracks has been prepared which outlines the essentials of diabetes. In so far as diet is concerned, a simplified and standardised system of measuring the food has been devised, and appropriate booklets have been prepared which are suitable for use by the physician, dietitian, and patient. These have received rather wide acceptance during the past three or four years since they became available.

Group instruction of patients and their families is also being carried out in some of the larger clinics for ambulatory patients and in local health centres. When well planned and carried out with the close co-operation and assistance of the patient's own physician, these group meetings or "classes" have been of real assistance to the patient as well as to the individual physician.

Professional education of physicians, nurses, and dietitians has also received attention. Aside from the undergraduate training, increased opportunities have become available for post-graduate training. An increasing number of special conferences, institutes, and seminars are being held throughout the year in widely scattered sections of the country.

It should be evident from what has been presented that diabetes mellitus is receiving increased attention from many groups of people

and organisations. It is equally clear that new developments are taking place rather rapidly. It is to be expected that those who are particularly interested in the care and welfare of old people will also take an active part in these developments as time goes on.

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GOUDRIAAN, J. C., Amsterdam. *The treatment of broncho-pneumonia in the aged.*

It is unnecessary, at a conference such as this, to stress the fact that broncho-pneumonia is one of the most frequent diseases in the aged. To illustrate this, a random sample of 100 cases of "autopsy-protocols" was taken, and broncho-pneumonia was found in 45 per cent.

1. In the official statistics of causes of death the figure is much [illegible] by the fact that physicians [illegible] however, from experience in geriatric medicine, that these typical physical signs are very seldom met with, and that in the majority of cases the broncho-pneumonia is characterised by a small diminution of the normal percussion sound, which may be accompanied by an accumulation of moist râles that sometimes show a tendency to become consonant. In a large number of cases the physical findings are little more than those of an acute and severe bronchitis; but, remembering that broncho-pneumonia so often attacks old people, we mostly make the diagnosis of broncho-pneumonia on general symptoms.

2. Often it is impo[illegible] broncho-pneumonia from capillary bronchiti[illegible] the treatment is the same [illegible] being afebrile, and the [illegible] by other conditions.

3. When we exclude the lobar form, which seems to me to be uncommon in the aged, we can divide broncho-pneumonia in the elderly into two different forms: (*a*) the "primary" broncho-pneumonia, which usually attacks aged persons who are in relatively good health; (*b*) the "secondary" (or "senile" or "weak" or "terminal" or—formerly—"hypostatic") broncho-pneumonia, the pneumonia of persons who are bedridden. I propose to call this form simply "bed pneumonia." This division agrees with the groups I and 3 of the classification of Reiman. It is well known that the first group [illegible] tract [illegible] influen[illegible] senile [illegible] been a[illegible] not to say probable—that the bacteriological ætiology of the two groups will be the same in many cases, but from the clinical point of view this classification is justified. In the investigation of the results of treatment I think it will always be necessary to adhere to this division.

If I put the question to you, "What is nowadays the best treatment of [illegible]?" I am sure that there [illegible] Surveys of the literature [illegible]ged are scarce, and in most [illegible] but no reliable directions for practical treatment. To contribute to the solution of the problem I have studied the results of treatment of 248 cases of broncho-pneumonia which have occurred amongst aged people in our Home in the last few years.

Patients were of both sexes and ages ranged from 60 to 90 years. The diagnosis was made on clinical symptoms and supported by bacteriological and hæmatological examinations. In the earlier years of the period of research we treated our patients with sulpha drugs, and in the later period with penicillin. The general and cardiovascular conditions of the patients were approximately the same. I have done my best not to flatter my statistics. In my opinion, an effective result is only recorded if the patient recovers completely in the clinical sense, so that the patient can get up, get about, and survives for some time. It is not practical to demand a negative sputum or negative hæmatological report. However important laboratory findings may be, we have to depend upon opinions based on clinical observation.

Penicillin treatment was effective in 82 per cent., sulpha drugs in 65 per cent. This difference is statistically significant. When, however, we consider the bacteriological control, we found that with penicillin 60 per cent. of patients were free from bacteria, whereas with sulpha drugs only 30 per cent. were free. This proves that the antibacterial action of penicillin is stronger than that of the sulpha drugs. With regard to the sedimentation rate of the blood, we found that it fell in almost all cases, but not always to normal.

After penicillin it fell to normal in 45 per cent., after sulpha drugs in 40 per cent. This difference was too small to be statistically significant. The percentage of cases in which the sedimentation rate did not reach the normal was nearly the same in both cases. This can be explained by the presence of other factors in the body which can be affected neither by penicillin nor by sulpha drugs.

Recurrence was not uncommon, both after penicillin and sulpha drugs, but the difference in the number of recurrences between the two groups of patients confirmed that the influence of penicillin on the bacteria of the broncho-pneumonia of the aged was greater than that of the sulpha drugs.

Summarising the results of my work, I think I am justified in saying my figures support the hypothesis that, generally speaking, penicillin gives much better results than sulpha drugs in the treatment of broncho-pneumonia in the aged. The fact, observed repeatedly, that we can save patients who were first treated by sulpha drugs by quickly changing over to injections of penicillin points also in this direction.

Anderson made a similar research and concluded that penicillin was not superior to sulpha drugs, but his patients were much younger than mine; yet he stressed the fact that broncho-pneumonia in the aged should be treated with penicillin. Even if with much larger groups of aged people results showed that the therapeutic value of penicillin and sulpha drugs was the same in this field, even then I should prefer to treat my patients with penicillin, for the following reasons:—

1. The influence of the sulpha drugs on the appetite.
2. The necessity of giving the patient a large quantity of fluid in order to avoid the danger of the formation of crystal deposits in the renal tubules.
3. The possibility of a toxic influence on the bone marrow and the necessity of control of the number of leucocytes.
4. The risk of allergic skin reactions, which can be severe in some cases.
5. The restriction of the diet.

Treatment with penicillin does not present these difficulties, and like previous authors I have found that it is harmless for the aged. I treated more than 200 patients with penicillin and I never found one toxic effect and hardly any allergic reaction, although I have sometimes used it repeatedly or for long periods. Three-hourly injections are no longer necessary, because we can get the *same* therapeutic effect by giving twelve-hourly injections. We only use the aqueous solution and give—at least during the first days of treatment—a somewhat larger dose than Stieglitz recommends, namely, 250,000 to 500,000 [illegible] each injection. It is a remarkable [illegible] "spectrum," [illegible] t few years I [illegible]. The results of this mixed therapy are encouraging.

Finally, a few words about the most recent antibiotics. It seems to me uncertain that they will oust penicillin in the treatment of

the worth of all
be acknowledged
as the best treatment. For the present, I thought I must tell you of my favourable experiences with penicillin in the treatment of
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ZIFFREN, S. E., Iowa. *The problems of burns in the aged.*

surface in patients over 65 years of age, and the group with burns of 25 per cent. or over carried a 100 per cent. mortality rate. This is in sharp contrast to the younger age groups.

The present paper includes a review of the thermally burned patients 60 years of age and older treated at the University Hospitals of the State University of Iowa during the years 1949 to 1953 inclusive. The purpose was to determine the causes of death and, if possible, to ascertain what might be done to overcome the very high death-rate.

Statistics—Thirty-four burned patients are included in this study. All had burns of a third-degree nature of more than 5 per cent. of th destruction of the
er
ity rate
of sharply
after the age of 70. In those who died the average third-degree burn involved approximately 25 per cent. of the body surface area. One fatal burn involved 6 per cent. of the body surface; the remainder had burns involving 15 per cent. or more of the body surface. Of those who lived, one burn patient had involvement of 25 per cent. of his body surface. The remainder ranged from 5 to 10 per cent. of body surface area.

Over 66 per cent. of the patients who died from burns in this series had proved infarcts of one organ or of several organs. Three other deaths occurred in this series in two of which the presumptive clinical cause of death was pulmonary embolus. However, no autopsy was obtained in these two cases. If these two deaths were included in this series the incidence of infarction would be 93·3 per cent.

Stress plays a significant role. Whether this is the main difficulty is unknown and whether the reaction in the aged is different from that in the younger patient is also unknown. However, burns cause severe stress, and in the aged this may be of greater importance than in a younger patient. For example, in a patient of 81 years who had been grafted for a burn of 20 per cent. of the body surface with almost 100 per cent. take of the graft, a series of eosinophil counts revealed a level consistently below 80 cu. mm. The counts were begun on the sixth day after grafting when the areas were almost completely covered with skin. The counts continued to fall to the time of the patient's death. She continued a downhill course with low plasma protein levels in spite of repeated blood transfusions, feeding by means of a polyethylene naso-gastric tube, adequate urinary output, and a relatively fair cardiac status. She developed venous thrombosis and splenic infarct. At autopsy the histological [illegible] cortical exhaustion were also [illegible] have [illegible] ted a [illegible]

[illegible] ctors may be [illegible] of infarction [illegible] itself results [illegible] nmary of the pathology of burns, made no reference to infarction as a cause of death in those who survived the early shock period, and neither did Harkins (5) in his monumental monograph on burns. In our group all the patients, except one, had survived the early period. It has been suggested that "sludging" of the blood may be a cause of thrombosis in burns, but this, too, occurs early. If "sludging" occurs experimentally, it is limited to small arterioles and venules. The occurrence of these infarcts, however, may well provide a clue as to the nature of the pathological physiology in these unfortunate patients.

When the charts of these patients are studied it is evident that many had low blood counts throughout their hospital stay, often in spite of repeated blood transfusions. Others had what appeared to be an adequate blood count, but the plasma protein levels were extremely low. These findings strongly suggest that the blood volume in these cases was low. This was especially true in the patient with granulating surfaces that had not been covered with skin because the patient was in such poor general physical condition it was felt he could not recover from surgery. Actually a vicious cycle was created with further protein loss and probably further depletion of the blood volume. [illegible] and diminished car[illegible] blood volume may [illegible] irreversible states.

Management—In the management of the newly burned, even those sustaining burns involving only 5 per cent, of the body surface

should be treated vigorously to prevent shock. This is in contrast to the younger age group in which group a burn usually comprises at least 10 to 15 per cent. of the body surface before requiring such therapy. The danger of shock and chronic hypovolæmia in the aged, with the greater danger of the patient falling into an irreversible deterioration make

—tl

trea former is usually the greater hazard. It is inadvisable to use the hæmatocrit as the guide to fluid administration. *The most practical* and safe guide is to follow the urinary output. By placing an indwelling catheter in the bladder and watching the hourly output of urine

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following days if it is not used. In addition, in the aged, a reduced blood volume is not uncommon (9). If severe trauma such as a burn is imposed upon such a patient, the need for blood is even more acute. Blood should be started immediately to prevent the onset of shock from which the elderly patient may never recover. A urinary output of 25 to 50 ml. per hour should be maintained. After 500 ml. of blood have been administered, a combination of saline and sixth molar sodium lactate—400 ml. saline and 100 ml. sixth molar sodium lactate—should be used. The *saline-lactate* mixture *more* closely resembles the electrolyte structure of extracellular fluid and is less likely to result in acidosis. Ordinarily, equal amounts of blood and of the saline-lactate mixture are used, but *the quantity* of the saline-lactate to be administered should rarely be greater than 1,500 ml. in twenty-four hours, for if it is in excess more œdema is likely. Whenever the patient can take fluids by mouth this route should be used for the electrolyte deficiency in preference to the intravenous route. A mixture of one teaspoonful —4 ml.—of salt and one of baking soda in a quart of water will provide the electrolyte needed orally without the danger of fluid overload and consequent further œdema. Sufficient 5 per cent. dextrose should be given to keep the intravenous needle open and to maintain an adequate urinary excretion. If the output is satisfactory and the specific gravity of the urine is low, the rate of fluid administration can be slowed. If the specific gravity is high, it should output falls below

2 administration—

12 this is a warning

of impending shock.

Such intravenous fluids are unnecessary after forty-eight hours and should be stopped. At the end of that time the diuresis will ordinarily begin if the patient is to recover (6). Further intravenous

fluid administration will only subject the patient to the hazard of being thrown into cardiac failure or pulmonary œdema.

The longer the period between burning and grafting, the more difficult becomes the problem, because the sepsis, the severe anæmia, and the prolonged protein loss are poorly tolerated by an elderly patient. To overcome this, one method is available—early debridement and grafting of the burns. To perform a debridement in an aged individual means that satisfactory and adequate blood replacement must be available, otherwise the patient will fall into irreversible shock from the blood loss that inevitably occurs at the time of debridement. It may be advisable to do this procedure in successive stages over successive or alternate days if the area is large. The debrided areas should be wrapped in fine-mesh petrolatum impregnated gauze, with pressure dressings. Ideally, the patient should be grafted immediately, but this may be too great an operative procedure. Usually, therefore, two days later the patient is returned to the operating room and grafted, using the thinnest of grafts, with a minimum of blood loss, in the shortest operating time possible. This will permit early coverage with skin and recovery. There has been a great tendency to feel the patient is too poor an operative risk to withstand debridement and grafting. But can the patient withstand the continued nitrogen loss and general depletion of his reserves? The surgeon is faced with a tremendous mortality unless a vigorous approach is made. He should not wait for the fourteenth day or later but rather should perform the debridement on the seventh to tenth days by which time the extent of the third-degree burned areas should be recognisable. He should never wait for the burned areas to separate spontaneously as this will usually take weeks, and during this time the patient will deteriorate and die.

Because of the tremendous stress the patient is undergoing, the necessity for adequate quantities of vitamin C must not be overlooked. It appears this vitamin is necessary in the metabolism and maintenance of adequate levels of adrenal cortical hormones (7, 8). An amount approaching 500 mg. daily is indicated. If possible, daily eosinophil counts may prove of help. A fall in the count when the patient has not undergone any operative procedure may serve as a warning to the surgeon of an impending complication (9). A persistent low count after grafting has been carried out undoubtedly carries a dangerous prognostic significance.

The marked protein losses which ensue in these patients can only be satisfactorily overcome by covering the patient with skin rapidly and completely. Replacement of blood is first necessary (10) and supplementation of diet by formula feedings, at times by means of a naso-gastric polyethylene tube, is necessary. However, again caution must be observed. The development of a "pseudo" diabetes as a result of the augmented excretion of adrenal cortical hormones may result in severe fluid loss as a result of the glycosuria (3). This may result in severe depletion of the blood volume with resultant shock and its possible fatal result in the aged. Accordingly,

such rich feedings are better given after ten to fourteen days have elapsed rather than in the early period of massive response to stress.

The administration of testosterone, 75 to 100 mg. three times weekly, is of value after the areas have been grafted; it may help bring the patient into positive nitrogen balance more rapidly.

amputation is lower than the mortality from the usual procedures necessary in the treatment of such a burn. This may seem a radical procedure, yet it may be the most conservative approach from a life-saving standpoint.

Problems—There are many problems that remain to be solved if we are to successfully treat the aged patient with burns. Is there some way to stop the tremendous fluid shift that occurs in the acute burn? Is there some simple way to detect third-degree from first-degree and second-degree burns as early as forty-eight hours after burning? How can we get rid of the dead tissue selectively without surgery in the first week after burning? Why does the tremendous and progressive blood loss occur? How can we tell when the patient needs supportive hormonal therapy? How can we tell when ... exhaustion? What gives

elderly patient so that this problem can be managed more accurately?

SUMMARY

Let me summarise ... Firstly, the mortality in the aged burned ... increasing age. Seco... incidence of thromb... means of dealing w... grafting. Fourthly, ... elderly patient are discussed.

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BROTHERUS, J. V., Finland. *Acute appendicitis in old persons.*

THE age limit was 50 years. The most important clinical observa- [illegible]

persons.

[illegible] Conditions

lumen is often missing, mucous membrane atrophic, and lymph tissue poor. This explains the increasing rarity of appendicitis in course of age.

When searching for reasons why destructive appendicitis is proportionately more frequent in old individuals, I made a histological study of the appendices of patients in different age groups, paying primary attention to those arterial changes which already existed before the last attack of the disease. The results were: (1) The appendiceal arteries of persons aged over 50 showed morbid changes in 55:125 cases, those of younger persons in 3:47. [illegible] In the [illegible] common [illegible] n 32:50 [illegible] arterial [illegible] (21:50 and 34:75). [illegible]

ing [illegible]

per [illegible] destructive appendicitis in individuals aged over 50. (2) Arterio-sclerosis has no share in the origin of appendicitis but only in determining the character of the disease arising from other causes.

FLEMMING, C., London. *Orthopædic surgery in the elderly.*

A GRADUAL increase in disability in the skeletal system is characteristic of old age. Orthopædic surgery should be invoked before disability has become crippling and while the will to recover remains.

The success or failure of surgical treatment can really only be judged on whether the patient is happier and more content as a result of treatment than without it. If a patient suffers from an acute emergency which is usually fatal, then success can be judged by the fact that the patient survives. Unless the disease is one that is usually fatal, [illegible]
used as a criter [illegible]
deciding whethe [illegible]
be undertaken. [illegible]
be measured as a statistical figure, but when considering crippling

disabilities in the old it is really their mobility and capacity to get about, their independence and their relative freedom from pain, that should be the things that guide one. Surgeons are, however, so obsessed by the question of mortality statistics that treatment is often denied to the old for fear that they may die as a result of it. Let me first briefly give my views on this point.

I will say at once that operation is not a necessary or primary means of dealing with orthopædic defects in the old, but it must be considered in many cases and, in fact, there is greater possibility for operation in old people than for similar disabilities in the young. Old people do not stand splints, traction, and prolonged courses of treatment, but they stand operations quite easily. Some little time ago an anæsthetist . . .

pulmonary infection are contraindications, but sheer age has nothing to do with the risks of an anæsthetic being given. This conservative attitude is very widespread, and that is my reason for labouring it to you. The question so constantly asked, "Will the patient stand it?" and the statement, "The general condition of the patient will not allow . . .
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undergo operation.

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and this is where the physician in charge is important. My practice, when . . . more than one
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propose and what it demands of the patient in effort. My colleagues and I know each other well on this subject, and we know that the details of operation are unimportant. It is the assessment of the patient as a whole person that matters. I cannot define what this means, but it does depend on the liveliness of people, their desire to live, and their hope of going home. It has been our experience on many occasions that a patient admitted for a surgical procedure has been assessed as not being suitable but, after a stay in the medical . . . become fit . . .

The . . . s
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may be physiotherapy or by surgery. . . . the fear that may have been missed. Hesitation is based partly on the fear that the skeletal system is incapable of repair or improvement in old people. This is a fallacy. Experience gained from *fractures in old*

people shows that power of repair remains throughout life if the vascular supply is good. Long periods of immobilisation are not well tolerated, but actual operations, if indicated, can be safely performed. Another reason why treatment is sometimes neglected is that the degree of restoration of function achieved is not considered worth the effort, but it may make the difference between limited independence and a life of confinement to bed. Case histories were used to illustrate the practical application of these points to individual patients.

If the patient is confined to bed already the indications for treatment are very clear, because the patient has nothing to lose—you cannot make him worse. I will give you an example of confused thinking. An old lady had the misfortune within a week to suffer a hemiplegia and fracture
treatment of the fracture
other disability. Actually
made it more necessary t
badly united femur or a hemiplegia but not both, was the frightened thinking of the people in charge, thus condemning her to a quite unnecessary crippledom. I think it is our purpose to make certain that that attitude of mind is removed.

WARREN, MARJORY W., London. *The management of the elderly double amputee.*

During the last five years eighteen double amputees have been admitted to the Geriatric Unit, West Middlesex Hospital, or have become double amputees during their time in the Unit. The purpose of this paper is to describe the treatment and management of these patients while in our care. Prior to 1949 I had only one elderly double amputee to treat—an old man aged 76 years in 1941. He learned to get about with two short wooden supports, but was not

of the conditions necessitating amputation, nor yet the surgical technique of the operation—but only the management of the patients after the second amputation.

Amputations in elderly patients are mostly necessitated by gangrene due to arteriosclerosis and/or to diabetes. With this underlying pathology such patients are, of course, liable to other vascular episodes—*e.g.*, cerebrovascular catastrophes, coronary thrombosis, etc. Previously and even to-day in many centres little interest has been or is shown in this type of case, and little rehabilitation has been practised. Despite this our experience has shown that full re-education of these patients is well worth while undertaking, both from a medical and a psychological and also from a social and economic point of view.

The table on pp. 564-565 gives particulars of eighteen patients—eight men and ten women with an average age of 74·4 years, who have lost both lower limbs for conditions of gangrene. Four of these patients were established diabetics, and the remaining fourteen for want of specific cause were labelled as arteriosclerotic. Five of these patients (three men and two women) are still under treatment and final results are therefore not available. One man (Case 2) is considered as unsuitable because he has a paraplegia with marked flexion contractures of both hips. One woman (Case 7) was a complete failure physically and mentally and died from a cerebro-vascular catastrophe shortly after treatment was started. The remaining eleven patients have all been educated to walk in pylons on the flat, and six, two men (Cases 4 and 10) and four women (Cases 6, 9, 13, and 14), have managed stairs as well.

A study of these patients shows that nearly all were suffering from other serious handicaps or developed such while under treatment, causing delays in rehabilitation and limiting progress.

In spite of these setbacks and from our total experience, however, we are now of the opinion that most, if not all, elderly double amputees should be educated to walk on pylons. We know also that when such treatment has been successful, in the majority of cases the patient can leave the hospital and can live at home with his own people or can be placed in a residential home, where he can enjoy a reasonably normal and interesting life. Such patients can become almost completely independent for most of their personal needs and can live in their own homes with comparatively little outside help.

The old method of leaving such patients in bed not only blocked permanently a hospital bed occupied by a heavy nursing case, but resulted in unnecessary misery and frustration of patients who, in the light of newer, methods can become substantially independent. With an ageing population, and so a likely increase in the numbers of such patients, it becomes even more important to free such beds for really sick patients and to liberate patients as often as possible to the added amenities and greater comforts and more congenial cond[illegible] which they rightly belong

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re-e[illegible]
[illegible] at this time is generally [illegible]

in reassuring a patient and telling him of the opportunities for re-education. Sometimes, indeed, it may be possible to obtain the services of a double amputee who is doing well in his own rehabilitation and persuade him to talk to the patient and help to allay his fears before the second amputation is done.

Even when this opportunity is not possible, a talk early after his operation for the second amputation can be very helpful. The

Case.	Sex.	Age.	First Amputation.	Second Amputation.	Admission to Geriatric Unit.	Additional Disability.
1	F.	74	May 1947	4.8.48	24.9.48	Cholelithiasis
2	M.	74	6.8.52	3.12.52	21.1.49	Paraplegia Deafness Peptic ulcer
3	F.	77	8.3.49	28.6.49	26.9.49	Ventral hernia Right hemiparesis
4	M.	79	1.5.51	21.11.51	28.3.50	Senile tremor
5*	M.	75	1942	18.11.48	28.8.50	Flexion deformity, hips Obesity
6†	F.	73	20.6.47	5.7.50	4.9.50	Flexion deformity, left hip Emotional
7	F.	76	5.5.49	9.2.51	13.11.50	Flexion adduction, left hip
8*	F.	76	29.10.49	1.6.50	20.11.50	Obesity
9*	F.	67	23.1.50	7.11.51	21.11.51	Diabetes Poor vision
10	M.	65	Jan. 1949	June 1950	28.11.51	Flexion deformity, hips
11	F.	81	Feb. 1951	13.1.52	11.1.52	Total blindness
12	M.	83	1947	1948	21.4.52	Poor vision Impairment, fine movements of hands
13	F.	80	May 1952	20.12.52	7.5.53	Coronary insufficiency
14	F.	76	6.10.52	23.10.52	12.5.53	None
15*	F.	74	1947	1948	24.6.53	Mental slowness
16†	M.	70	4.10.51	16.1.54	16.11.53	Abdominal aneurysm
17*	M.	74	27.3.52	9.9.53	17.3.54	Epithelioma penis
18	M.	65	10.11.52	30.9.53	20.3.54	Myocardial infarction

* Patients marked with asterisk were suffering from diabetic gangrene, others from arteriosclerotic gangrene.

Complications during Rehabilitation.	Onset of Rehabilitation.	Pylons Fitted.	Ambulant on Flat.	Ambulant on Stairs.	Ready for Discharge.
Cancer of liver	Dec. 1948	Dec. 1949	Feb 1950	Not attempted	Aug. 1950
Hæmatemesis	Not attempted	..			Still in hospital
Right hemiplegia with aphasia	27.9.49	Oct. 1950	Nov. 1950	Not attempted	Died 21.2.53
Re-amputation	15.12.51	Feb. 1953	Mar. 1953	May 1953	Home 4.5.53
None	28.8.50	Apr. 1951	June 1951	Not attempted	Welfare Home July 1951
Painful stump	4.9.50	Feb. 1951	May 1951	July 1951	18.8.51
Cerebral thrombosis Arteriosclerosis	13.11.50	...	...	.	Died 22.7.51
None	20.11.50	Feb. 1951	May 1951	Not attempted	Home 9.5.51
None	21.11.51	Mar. 1952	Apr. 1952	Apr. 1952	Home 25.4.52
Osteomyelitis Myocardial infarction	28.11.51	Aug. 1952	Sept. 1952	Apr. 1953	Sept. 1952
None	6.3.54	..	.		In training
Chronic chest	21.4.52	Aug. 1952	Sept. 1952	Not attempted	22.1.53
None	7.5.53	June 1953	Aug. 1953	Sept. 1953	1.10.53
None	12.5.53	July 1953	Aug. 1953	Aug. 1953	5.9.53
Septic finger	24.6.53	Feb. 1954			In training
None	11.2.54	...	...	..	In training
Amputation of penis	12.5.54	...	..	.	In training
Re-amputation	20.3.54	...	..	...	In training

† Patients marked with dagger were fitted with artificial leg after the first amputation and were able to walk about until gangrene of the second leg.

knowledge that he will certainly become ambulant in a self-propelled wheel-chair of his own and that he may be able to get about on pylons (or even legs) gives ground for considerable optimism to a patient who feels doomed to permanent dependence upon others and can see no future beyond his bed (and that perhaps in a hospital).

It is important also for the surgeon to bear in mind that the stump must always be adequate to carry a prosthesis. No matter what is the mental or physical state of the patient at the time of operation, it is impossible to assess his future capacity for rehabilitation, and no one should therefore be discouraged at this early stage.

[illegible]

The commonest contractures are flexion and adduction of the hip joints. The development of such contractures makes the fitting of the pylon more difficult and weight-bearing and balance less stable.

At the same time the patient must be encouraged to develop full use of his upper limbs, and learn to balance his trunk. In such circumstances dressing and undressing and many other personal attentions should form part of the daily occupation of every such patient. Double amputees can and should use a self-propelled wheel-chair as soon as the sutures are removed after operation. At first a patient should be tied into his wheel-chair, so that he does not overbalance and fall while propelling the wheels forward. Such a fall at this stage is very demoralising both to patient and to staff, and is liable to undermine morale with considerable loss of self-confidence and therefore to delay progress.

When a patient has been provided with a wheel-chair fitted with a brake, then he should learn by one of a variety of methods to get from his bed to his chair and back from his chair to his bed.

This independence for personal needs, and ambulation in a wheel-chair, not only occupies a good deal of each day, but it does much to restore self-esteem.

Occupational therapy and physiotherapy should be utilised as much as possible at all stages. Occupational therapy will vary considerably according to the tastes, mental capacity, and physical state of the patient, but should be full and continuous.

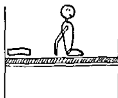
Physiotherapy should be undertaken on the following lines:—

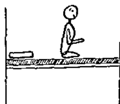
1. Stump exercises for *both* stumps.
2. Exercises for the upper limbs. These should be general, [illegible] where there is a residual [illegible]
3. Ex[illegible] trunk in a good erect posture.
4. Exercise in rising from the prone to the sitting position on his bed (see Figs. 1, 2, and 3) without counter-weight on his stumps or other help. This can be achieved by all patients if properly re-educated.

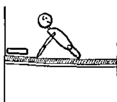
While sitting on his bed the patient can place his hands on the bed behind him and thus, raising his buttocks from the bed and resting on his stump ends, fix his hips and pelvis (see Figs. 2 and 4).

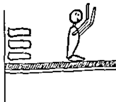
5. Exercise in balance should be undertaken by getting the patient to sit on his bed and raise his upper limbs above his shoulders and later in this position to throw his pillows from his bed to a nearby chair (see Figs. 5 and 6).


FIG. 1


FIG. 2


FIG. 3


FIG. 4


FIG. 5

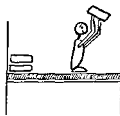
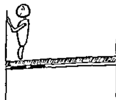
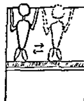

FIG. 6


FIG. 7


FIG. 8


FIG. 9

6. Exercise in rising on to the stump ends from a sitting position and in sitting again. This exercise can well be given on the bed using the rail at the head of the bed—and is made easier *when boards* are placed under the mattress to give additional rigidity. In this position, with practice, the patient *may* stand first on one stump and then on the other, and so can learn to walk across the bed holding on to the bed head, which should be not less than 20 in. or 50 cm. above the mattress level (see Figs, 7, 8, and 9).

Throughout this early period of rehabilitation the stump should be bandaged daily to develop a good conical shape for the pylon bucket. By means of these exercises in addition to attention to his personal needs and by regular bandaging, the patient and his stumps are prepared for the use of pylons.

Pylons (structure)—Modern short pylons—the result of much research work in the limb-fitting centre at Queen Mary's Hospital at Roehampton—offer great advantages over the older types. The pylons are much lighter in weight, average 8 lb. (3·6 kg.), and measure 24 in. (60 cm.) from belt to floor. The buckets are made of plastic material held in position by a light metal frame and attached to the waist belt by a strip of metal capable of movement about a simple joint. The curved rocker foot-pieces are made of light plywood and point backwards, enabling the patient to throw his weight forwards when walking.

Use of pylons on the flat—When the patient is as independent as possible and competent in the exercises described, *and* NOT *before*, he should be provided with pylons and these should be made with all speed. It is useless to provide pylons until a patient is able to balance himself well and to stand on his stump ends as previously described, and too early provision will only frustrate a patient and retard progress.

As soon as he is ready, however, pylons should be provided, and we have found from our experience that the sooner he is fitted with pylons the shorter is the time needed to complete his re-education. In the earliest stages with pylons the best method of education is to use two parallel rails—the " walking lane." Following the use of the two rails, the majority of elderly patients need two [illegible] for [illegible]. In [illegible] of [illegible] to walk on the flat with two four-legged sticks and without help then, in the majority of cases, he should attempt stairs. The stairs should preferably be provided with a rail on each side of the staircase.

We have now established beyond any doubt that a patient should descend stairs backwards and ascend forwards when using the rocker pylons. To descend forwards throws the patient's weight to the edge of the stairs, and with narrow stairs actually beyond the edge, with the inevitable feeling of danger and tendency to fall forwards; whereas descent backwards leaves the weight close to the rise of the stairs in a safe position. It was lack of this knowledge which prevented the re-education of our earlier patients on the stairs and so deprived them of additional independence.

In spite of the simple structure of the modern short pylon, elderly patients usually find it difficult to get into them without

help. We have found a variety of methods useful in different individuals, but these will not be discussed here. Whenever it seems possible to educate the patient in this procedure it should be done in spite of the difficulty of accomplishment.

Throughout the treatment and management of the double amputee it is necessary to watch and treat all other conditions [illegible] diabetes, etc. Vision [illegible] aids supplied and, [illegible] obesity, which is a [illegible]

The best results will follow when treatment is undertaken in an atmosphere of optimism and healthy rivalry.

Meticulous care of detail, painstaking precision of planning, and continuity of care are essential as in all good medicine—and with these and the co-operation of the patient good results can be obtained, but not easily.

It is our experience that the best results are obtained when treatment is energetic, continuous, and early after amputation.

After-care of the double amputee—An essential service to the elderly double amputee is good continued supervision in order to note as early as possible any deterioration in the pylon, the patient, [illegible] or damage needs [illegible] marked deterioration of the patient in a very short time. Unnoticed deterioration of a patient may well lead to inability to wear a pylon unless early corrected. Deterioration of social conditions which are not known may well become irreversible and necessitate readmission to hospital.

In closing this brief account of treatment of elderly double amputees, I wish to acknowledge the help which I have had from a number of medical colleagues, and especially to mention Dr M. M. Pam and Dr J. Kaminski, both of whom are here to-day and still working with me.

DISCUSSION

Mr L. GILLIS started discussion on the question of surgery in [illegible] He said that arteriosclerosis, atheroma, [illegible] modern means is adequate. [illegible] should depart from the ordinary [illegible] people. We should [illegible] amputation." Mr [illegible] surgical technique involved in amputation, and drew attention to the advisability in

some cases of a below-the-knee amputation with very short stumps. He also advocated the use of a two-way stretch elastic stump sock which did much to reduce the œdema at the end of the stump and had the advantage that it could be easily placed by the patient himself.

Professor C. G. Rob: "I should like to ask Dr Warren what length of pylon she chooses. Does she shorten them down?"

Dr Marjory Warren: "I have not worked out the height, but the ones provided are 24 in. from the waist belt to the floor. That means that the patient standing is at approximately the same height as he would be if kneeling."

Professor Rob: "So they are shortened?"

Dr Marjory Warren: "Yes, and they maintain a far better balance. We have had a number of patients, some of whom have asked for limbs and some of whom have been encouraged to have limbs, and in most cases they do not carry them as comfortably or as well as the short pylons."

SOLOMON, W. M., ZEITER, W. J., and NELSON, P. A., Cleveland. *Comprehensive physical medicine and rehabilitation for degenerative joint disease.*

Degenerative joint disease (osteo-arthritis, hypertrophic arthritis) is the most prevalent of all joint disorders. The cause is unknown. Trauma, often imperceptible and repeated frequently, is a definite [illegible]

[illegible] paraffin baths. The knees, as weight-bearing joints, are [illegible] to considerable stress and strain. Heat, massage, and exercises to increase the strength of the quadriceps relieves symptoms and may be factors in preventing further damage. The hip joint is the most crippling and disabling. Heat, particularly diathermy, and exercises are given to strengthen the abductors and extensors. A cane, pelvic belt, and traction may be needed. The spine, another weight-bearing structure, usually shows lumbar lordosis and dorsal kyphosis. Exercises to correct postural defects may be the most important measures to relieve symptoms. Examination of feet should always be included in degenerative joints involving the spine and knees.

Rehabilitation in all its various phases should be a part of the [illegible]

PORSMAN, V. A., Copenhagen. *Statistical results of rehabilitation in "The Old People's Town" in Copenhagen.*

TO-DAY in Denmark, as well as in other countries, the work of the physicians is concerned to an ever-increasing extent with geriatric patients, and the same is the case in the hospital wards, especially the medical ones. The age distribution of the patients has changed completely during the past thirty years, which fact has been borne out clearly by an investigation made by Professor Meulengracht in Copenhagen. In 1922 the majority of the patients admitted to the medical ward of which Professor Meulengracht is the head were under the age of 50. In 1941 the majority of the patients were over 50 years old, and in 1950 this distribution had altered still more, so that there was already then an enormous accumulation of old people between 60 and 80.

The change in the age distribution has resulted in a change in the diseases. Now it is the chronic diseases which dominate the cases admitted to the hospitals. The work of the physicians is now more of a social-medical nature. If, after the treatment, the patients are unable to take care of themselves they will have to be transferred to a welfare institution specially intended for the care of patients with chronic diseases.

For many years the Corporation of Copenhagen has had an in-
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is
departments :—

1. A general department, housing 372 men and 362 women, for residents without the need of daily medical attention;
2. A nursing department, for residents partially able to look after themselves; and
3. An infirmary for bedridden patients;

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phy
tion for one consultation a week, and specialists in dermatology, neurology, surgery, orthopædic surgery, and otology are also available.

... attached to the institution
as
w
th ... able to look after themselves ... principles governing our method of working, and to give a review of the commonest diseases we receive for treatment and of the results of rehabilitation of these patients.

Besides the ordinary medical examination, every patient referred

for rehabilitation is subjected to a physical examination comprising active and passive movement of the joints, the testing of muscular strength, a general neurological examination, a palpatory examination of the soft tissues, an assessment as to whether the patient is capable of standing and of walking. At the same time the patient's daily activities are tested by means of a table in which all the movements which the patient will have to make in order to look after himself are listed. Based on this examination, which is attended by the physiotherapist who is to undertake the treatment, the latter is instructed to start physical therapy. We attach special importance to active exercise of the movements which are necessary in order that the patient may manage the daily activities. At the same time the nurse is instructed to get the patient to make these movements several times a day. If some of the movements can be carried out through occupational therapy, the patient is given work requiring the use of the movements aimed at. If orthopædic therapy is indicated, for example, straightening of contractures, increase of the height of footwear in the case of static deformities, bandaging of joints in the case of pareses, such therapy is carried out.

The cases where rehabilitation is specially called for are diseases located in the locomotor system. In order to get an idea of the number of patients who were disabled by these diseases and of their nature, I examined, in 1952, all the cases in one of the large wards of the infirmary. Of 157 patients, eighty-five appeared to suffer from ailments in the locomotor organs, resulting in disablement.

TABLE I

HEMIPLEGIA

Infirmary	52
Nursing department	22
General department or home	27
Died during observation time	27
Total	128

OSTEO-ARTHRITIS IN HIPS, KNEES, AND SPINE

Infirmary	43
Nursing department	20
General department or home	65
Died during observation time	8
Total	136

The aim of our therapy has been to make the patients physically independent, so that it has been possible to transfer them either to their homes, to our General Department, or to the Nursing Department.

From 1st July 1952 to 1st January 1954 we have attempted the rehabilitation of 325 patients admitted to the infirmary as bedridden.

The results within the various groups of diseases will appear from the following table :—

TABLE II

RHEUMATOID ARTHRITIS

Bedridden when beginning the rehabilitation	26
Infirmary	16
Nursing department	2
General department or home	1
Died during observation time	7

FRACTURES IN THE INFERIOR EXTREMITY

Bedridden when beginning the rehabilitation	50
Infirmary	27
Nursing department	11
General department	11
Died during observation time	1

I have used movement from one department to the other as index of improvement.

In the cases where rehabilitation has failed, the cause has most frequently been dementia, the attainment of a result being highly dependent on the ability of the patient to co-operate. There may be many different causes of dementia, but I have no doubt that some [illegible]

institution they had to abandon their homes.

It is obvious that the rehabilitation of old patients is greatly impaired by the fact that rehabilitation is commenced only after they have been given up by a general hospital. When it is at all possible to rehabilitate some patients, the results would be considerably better if treatment were commenced before the patients were disabled to such an extent that admission to a hospital is necessary. This has also been proved in this country and in the United States, where geriatric clinics have been established, giving medical and social aid to out-patients. In the autumn of 1953 a private committee was set up in Copenhagen with a view to the establishment of such a geriatric clinic, which is to be headed by a specialist in internal medicine, a psychiatrist, and a specialist in physical medicine, with the aid of nurses, home helps, occupational therapists, and physiotherapists, who are to treat the patients partly in their homes and partly at the clinic. It is our hope that the [illegible]

to-day. It would then be possible to avoid occupation of costly hospital space by the old people, and to make them physically independent as long as possible—to the benefit of themselves and the community.

HERBEUVAL, R., CUNY, G., MANCIAUX, M., and HANSEN, J., Nancy. *The study of the distribution of blood protein fractions in 200 aged subjects.*

The study of blood proteins in geriatrics has already been the object of numerous research works. These have endeavoured to demonstrate by chemical methods, in old people, the variations in the

ratio.

requires very delicate handling, which considerably restricts its routine use in the laboratory. For this reason paper-

Durrum's. The filter paper upon which were deposited five drops (2·5 cu. mm. each) of serum (four pathological and one standard normal) was placed in a holder. The two ends of the paper dip into a trough filled with solution at pH 8·6 containing veronal soda (0·5 minim), veronal acid (0·01 minim), distilled water q.s. The sheet of paper, in a solution of blue d dried. The strips thus prepared were then soaked with paraffin oil and fitted into an automatic registering photometer. The resulting electrophoretic curve resembled closely the classical curve by Tiselius.

The interpretation of the results was made by comparing them with the curve from a normal subject. Therefore, only relative and not absolute values can be obtained. All quantitative estimations are subject to error and we have not carried them out.

Our study is based on 236 observations (106 women and 130 men) ranging from 60 to 90 years.

Results—The results are obtained by comparison with normal serum as standard. They are noted in Table I:—

TABLE I

	Albumin.	α1.	α2.	β.	γ.
Minus	124	22	32	64	52
Normal	110	100	76	90	86
Plus	2	114	128	82	98

In Table II these figures are translated into percentages:—

TABLE II

	Albumin.	α1.	α2.	β.	γ.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Minus	52·5	9 3	13 6	27·1	22·0
Normal	46·6	42·4	32·2	38·1	36·5
Plus	0·9	48·3	54·2	34·8	41·5

It was possible, therefore, to make the following tentative conclusions:—

1. *The albumin* was decreased in more than half the cases. The decrease was, however, mostly of small degree. On the other hand, the values were only augmented in two observed cases. A fall in the albumin values appears to be so common in protein metabolism that particular conclusions cannot be drawn.

2. α1 *globulins*: These, on the contrary, are frequently increased (50 per cent. of the cases).

3. It is the same regarding globulins α2.

4. The variations in fractions β and γ are less significant. They are, nevertheless, appreciable, one-third of the subjects having normal fractions β and γ, one-third augmented, and one-third reduced.

In conclusion there are therefore trends in opposite directions in the proteinogram in aged individuals: Reduction of albumins, increase of globulin fractions.

We have set down our results as a function of age in Tables III, IV, and V, each representing a decade:—

TABLE III

60 TO 70 YEARS (seventy-eight observations)

	Albumin.	α1.	α2.	β.	γ.
Minus	36	12	10	20	24
Normal	40	38	32	32	26
Plus	2	28	36	26	28

TABLE IV

70 TO 80 YEARS (110 observations)

	Albumin.	α1.	α2.	β.	γ.
Minus .	54	10	18	24	24
Normal .	56	50	28	46	42
Plus .	...	50	64	40	44

TABLE V

80 TO 90 YEARS (forty-eight observations)

	Albumin.	α1.	α2.	β.	γ.
Minus	34	. .	4	20	4
Normal	14	12	16	12	18
Plus .		36	28	16	26

We have set down in Tables VI, VII, and VIII the percentage of the results obtained :—

TABLE VI

60 TO 70 YEARS

	Albumin.	α1.	α2.	β.	γ.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Minus	46	15·3	13	26	31
Normal .	51	48·7	41	41	33
Plus .	3	36·0	46	33	36

TABLE VII

70 TO 80 YEARS

	Albumin.	α1.	α2.	β.	γ.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Minus .	49	10	16·4	21·8	21·8
Normal .	51	45	25·5	41·8	38·2
Plus .	...	45	58 0	36·4	40·0

TABLE VIII

80 TO 90 YEARS

	Albumin.	α1.	α2.	β.	γ.
	Per cent.	Per cent.	Per cent	Per cent	Per cent.
Minus .	70		8 3	41 7	8 3
Normal .	30	25	33 3	25 0	37·5
Plus .	.	75	58 4	33 3	54 2

These tables indicate the following:—

1. The fall in the albumins affects a greater number of subjects as age increases: 46 per cent. of the cases between 60 and 70; 49 per cent. of the cases between 70 and 80; 70 per cent. of the cases between 80 and 90 years.

2. The inverse phenomenon is found for the fraction α1 globulin. Its increase affects 36 per cent. of the subjects between 60 and 70 years of age, 45 per cent. between 70 and 80 years, and 75 per cent. from 80 to 90 years.

As for globulin α2, the progression is the same way as for α1 but a little less marked: 46 per cent. for 60 to 70 years, 58 per cent. for 70 to 80 years, and 58 per cent. from 80 to 90 years.

3. On the other hand, it is not possible to establish a clear relation between the progress of age and the augmentation changes in β globulin fractions.

4. Finally, an increasing proportion is again found for γ globulin. 36 per cent. of the subjects have their globulins increased between 60 and 70 years, 40 per cent. between 70 and 80 years, and 54 per cent. between 80 and 90 years.

The double tendency which we have pointed out in the tables is therefore accentuated as the subject advances further in years.

Secondary variations in certain pathological states—Our study having been mainly of a total geriatric population, it goes without saying that some of our subjects showed some pathological manifestations. We have therefore tried to find out if their presence modified the preceding findings.

TABLE IX

	Albumin.	α1.	α2.	β.	γ.
Minus .	8	4	4	8	2
Normal .	6	8	...	4	8
Plus .	..	2	10	2	4

These results appear, therefore, to be different from the general results in several points:—

Less frequency of rise of α1 globulins.
Globulin fraction β more frequently reduced.

Our series is of small extent, but we believe that there is more than a coincidence here.

2. *Arterial hypertension*: Thirty subjects showed some arterial hypertension, sometimes of long standing, but well borne except for a few subjective complaints.

TABLE X

	Albumin.	α1.	α2.	β.	γ.
Minus .	8	2	6	4	8
Normal .	22	22	10	14	6
Plus .	...	6	14	12	16

The ratio for albumin was, on the whole, normal in contradistinction to the general statistics. If those suffering from hypertension were excluded from the geriatric population, the percentage with hypo-albuminæmia was further increased.

The α1 globulins, the quantity of which increases progressively [illegible] in our view, any interpretable variation.

3. *Senile osteoporosis*: In ten women were found manifestations of senile osteoporosis, clinically and radiologically. Two even had a fracture at the neck of the femur. We did not find in them [illegible] *primum movens.* It is already known that a part of the modifications of β globulins is linked up with the disorder of lipid metabolism which is present in atherosclerosis. At the same time it would be [illegible] particularly striking.

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CHAPTER XIV

RESIDENTIAL CARE

AVES, GERALDINE M., London. *Introduction.*

This session is held with the acceptance of the view that so far as possible the care of old people in their own homes, with the services that permit of their living in their own homes, has priority. However, we must accept that there are persons who for one reason or another [illegible]

different aspects of this problem. We shall hear something about [illegible]

in charge of special homes, activity programmes for persons living in groups, and finally the ways in which the care of old people in homes may be related to the kinds of services found in the outside community.

KRAG, C. L., Washington, D.C. *Current trends in the institutional care of the aged in the United States.*

There has been a progressive increase in the numbers and relative proportion of older people in the total population of all the countries comprising the Western world, and one of the special problems of concern to governmental and social agencies is that of providing adequate institutional care for elderly people.

In the United States various attempts have been made and are being made to obtain information [illegible] of the residents of the different [illegible] institutions themselves. A limited [illegible] while information is available from [illegible] the decennial population census report. One of the most recent of the reports prepared by the Bureau of the Census, United States Department of Commerce, is the special report of Institutional Population (P.E., No. 2, C.) for 1950. This report shows that the total estimated population of 150·7 million persons of all ages in [illegible]

special hospitals for tuberculosis, mental, and chronic illness, prisons and similar correctional institutions; homes and schools for the mentally and physically handicapped, neglected, and dependent children. Excluded are general short-term hospitals, although they also care for people with chronic illness for long periods of time.

Of the 1½ million persons in institutions, 385,419 were 65 years of age or over. This was 3·14 per cent. of all persons of 65 years of age and over in the United States in 1950 (12·3 million persons). The percentage of older persons confined to institutions increased

TABLE I

PERSONS IN SELECTED AGE GROUPS IN INSTITUTIONS IN THE U.S.A. *BY TYPE OF INSTITUTION*, 1950

Type of Institution.	Persons 65 and Over.		Persons 75 and Over.		Persons 85 and Over.	
	Number	Percentage *Distribution.*	Number.	Percentage *Distribution.*	Number.	Percentage *Distribution.*
Total	385,419	*100·0*	*209,543*	*100·0*	*54,314*	*100·0*
Homes for the aged	217,536	56·4	145,151	69·3	42,307	77·9
Public	60,424	15·7	31,565	15·1	7,838	14·4
Federal-State	14,218	3·7	*6,319*	*3·0*	*1,372*	2·5
Local	46,206	12·0	25,246	12·0	6,466	11·9
Private	157,112	40·7	113,586	54·2	34,469	63·5
Non-profit	65,204	16·9	47,936	22·9	13,393	24·7
Proprietary	91,908	23·8	65,650	31·3	21,076	38·8
Mental hospitals	141,346	36·7	54,732	26·1	9,955	18·3
Federal	2,674	0·7	788	0·4	102	0·2
State-local	131,822	34·2	49,918	23·8	6,841	16·3
Private	6,850	1·8	4,026	1·9	1,012	1·9
Chronic disease hospitals	8,857	2·3	*		*	
Tuberculosis hospitals	6,592	1·7	*		*	
Correctional institutions	*5,140*	1·3	*		*	
All others	5,948	1·6	*		*	

* Not available (65 and over only)

Source: Bureau of the Census, U.S. Census of Population, 1950: Special Reports, Part 2, Chapter C, Institutional Population, pp. 16 to 18.

progressively with age: 1·77 per cent. of all persons 65 to 69 years of age were in institutions, 2·56 per cent. at 70 to 74 years, 4·74 per cent. at 75 to 84 years, and 9·41 per cent. at 85 years of age and over.

TABLE 31

ESTIMATED NUMBER AND PERCENTAGE OF PERSONS AGED 65 AND OVER IN INSTITUTIONS OF SPECIFIED TYPES, 1900 TO 1950, IN U.S.A.*

Year.	Persons Aged 65 and Over in Institutions.					
	Total.	In Institutions Primarily for Aged.			Mental Hospitals.	Other.
		Total.	Public.	Private.		
	Number (in thousands).					
1950 .	385	217	60	157	141	26
1940 .	222	118	58	60	88	16
1930 .	188	132	80	52	56	..
1920 .	133	102	71	31	31	...
1910 .	109	87	62	25	22	...
1900	78	65	47	18	13	...
	As Percentage of Total Population Aged 65 and Over.					
1950	3·1	1·8	0·5	1·3	1·1	0·2
1940 .	2·5	1·3	0·6	0·7	1·0	0 2
1930 .	2·8	2·0	1·2	0·8	0·8	...
1920	2·7	2·1	1·4	0·6	0·6	...
1910 .	2·8	2·2	1·6	0·6	0·6	..
1900	2·5	2·1	1·5	0 6	0·4	...

* From Table 5, p 12, *Social Security Bulletin*, October 1953.

The distribution of the 385,419 persons of 65 years of age and over among the various types of institutions is as follows: 56·4 per cent. of these aged persons were cared for in homes for the aged, of which proprietary commercial institutions accounted for 23·8 per cent.; 36·7 per cent. were in mental hospitals, and the remaining 6·9 per cent. were cared for in all other types of institutions. With increasing age the percentage cared for by private homes for the aged increased; there was a corresponding decrease in the percentage cared for by mental hospitals. If one compares these data with the estimated 504,504 short-term hospital beds in 1950 it is revealed that the total number of all persons of 65 years of age and more residing in the various institutions is equal to three-quarters of the *total* number of short-term hospital beds.

During the last fifty years there has been only a very slight increase in the percentage of persons 65 years of age and over residing in institutions. In 1900 it was estimated at 2·5, and *to-day* it is

estimated at 3·1. Nevertheless, marked shifts have occurred between different types of institutions. Chief among these changes has been the percentage increase of older people cared for by mental hospitals and private institutions for the aged, and a corresponding decrease in the percentage cared for by public institutions.

Information regarding other aspects of the institutional care of the aged is available for many States and localities in the United States, but for the country as a whole facts are lacking, except for hospitals. It is anticipated, however, that in the near future more information will be available, and a significant advance in this direction has been the development of State-wide institutional licensing programmes now operating in each of the forty-eight States. In addition, some of the national voluntary associations are engaged in activities which are intended to provide information so that the level of care provided by institutions for older people may be raised.

It is apparent that rather marked changes are taking place in the field of institutional care of the aged. The number of people 65 years [illegible]

changes that have occurred have largely been due to differences in utilisation of the various types of institutions. These changes in utilisation are due apparently to the effects of tax-supported welfare and institutional programmes. The increase in the proportion of older people cared for in private institutions can be attributed to the development between 1940 and 1950 of tax-supported welfare programmes which provide cash grants to the individual for the payment of care in a private institution. The relative decrease of [illegible] for the aged and dependent, commonly [illegible] s" and almshouses, has [illegible] increase in a different type of tax-supported institution—the State Mental Hospital. This has created new problems, because it is generally recognised that mental hospitals are not usually able to care properly for large numbers of older people, and serious questions arise regarding the [illegible] edical care and [illegible] more attention [illegible] l this trend will create new institutional patterns [illegible] of to-day.

GOOD, JEAN M., Toronto. *Residential care of old people in Canada.*

Regional characteristics of Canada—There is a wide variation in the residential care provided for old people in the different parts of Canada. These differences reflect the regional characteristics in

British and " melting pot " of the original and where the siatic countries. tutional patterns es and practices. of Britain and France, and ... "Housing for Older People"—a ... of Canadian practice in 1951-52, done by Mr Wm. S. ... This situation was set out in a report, ... The study ... Corporation, the lending institu... Act, pursuant to a recommendation of the Joint Committee of the Senate and House of Commons, on Old Age Security, June 1950.

Although Old Age Security payments are made by the Federal Government to people over 70 years of age right across Canada, provincial statutes govern the development of old people's homes in each of the ten provinces. In actual practice most of the communal residential care in Canada is provided by local voluntary money, and the administration of such homes is in the hands of religious orders, fraternal or service club groups, voluntary boards, church ... etc. Residential care for old people in Canada is ... s not accepted as having a valid ... ional housing authorities or by

The province of Ontario is promoting the erection of new modern buildings to replace old Houses of Refuge which served one or ... roof are housed those ... ose requiring ... ated locating

... lfare Council, ... blic Welfare, ... rogramme of

prepared a report " Suggestions for a Co... ... Community Services for Older People in Toronto." As a building programme will be undertaken shortly to provide homes for the aged for 1,200 people in this area, the report recommended that for old people who require residential care communal homes to ... people, including men, women, and ... locations

... 000

In Metropolitan Toronto, where there ... residential care is provided for 1,812 people over 60 years of age, old people in seventeen institutions. All of these buildings are located close to shops, transportation, churches, and places of entertainment. The number of residents in the homes varies from twenty-nine to 600, and the type of accommodation varies from single rooms with tray service to thirty-bed dormitories.

HILL, MARGARET N., London. *Homes for old people in England.*

During the last ten years great strides have been made in the provision of special accommodation for the ageing population. Progress has been proportionately greater in regard to residential accommodation than in the housing of old people. Before 1939 little progress had been made in the reconstruction of old workhouses to suit modern requirements, and few voluntary committees had opened old people's homes, with the exception of those run by the Salvation [illegible] who had carried out pioneering [illegible] the

During the war large numbers of old people were displaced from their homes, and it became necessary to find accommodation for thousands of homeless aged men and women. During and after the war new building was extremely difficult, and both voluntary and statutory bodies set to work on the adaptation of existing houses for the reception of the old in small community homes. At the [illegible]

resi[illegible]

peo[illegible]

this is clearly undesirable. [illegible]

small flats and houses built by local authorities [illegible] 71,000, but these are not primarily for old people. Between 1945 and 1947 the proportion of small dwellings was only 3·3 per cent. of all new buildings, but this year it has risen to 10·2 per cent. These figures do not include small houses built by private enterprise, but the number of these cannot be large. It is my opinion that there will be less emphasis on residential care when there are more suitable houses and flats for old people.

A great variety of communal homes are required to meet the needs of old people who can no longer manage for themselves. They can be divided into the following four categories:—

1. Hc[illegible] able-bodied,

2. I[illegible] diseases for

3. [illegible]

convalescence or while their relatives wish to be away on holiday. Many relatives, in fact, would more willingly look after their old people if they were not completely and permanently tied to them from one year to another.

4. Homes for the mentally ageing who suffer primarily from forgetfulness, but also from minor delusions and eccentric behaviour.

This last group includes those for whom there is least provision at present. They are not suitable for mental hospitals, and there are only a few voluntary homes catering for them in this country and few, if any, statutory homes. The old people in these homes are often a great embarrassment to their friends and relatives; some of them have been in mental hospitals, and on recovery, although no longer in need of hospital care, they are unable to live alone. At a home of this kind, which I know well, none of the residents is bedridden, and the majority go out daily. Indeed, great activity and a certain restlessness is a common feature. The residents are [illegible] they do not remember [illegible] Many are fond of [illegible] get activity amongst these people than amongst many ordinary old people. They make friends easily, and such friendships are of great value in counteracting the loneliness of an ageing mind. Small dormitories are better for them than single rooms—it makes supervision easier, and on the whole these residents value privacy very little. The administration of a home of this type is necessarily rather more expensive than ordinary old people's homes on account of the greater number of attendants required.

[illegible] can be absorbed [illegible] ordinary homes can cause much unconscious trouble, which is not necessarily understood by their companions. These people often have idiosyncrasies which render them anti-social in an ordinary [illegible] they are [illegible] present time in most parts of the country there are no small homely places to receive them. They have frequently found the effort of living alone too much, and are consequently half-starved and physically neglected. Good and regular food has a marked effect in improvement. These people take longer to settle in new surroundings than the ordinary old person, and they are very dependent on those they know and are fearful of strangers. They suffer much from the shock of being removed from one place to another, but when they settle down they enjoy small domestic jobs in the homely atmosphere of the ordinary house. It is common to write off the mentally senile, and that is a great mistake. Many of them have,

combined with forgetfulness and such kinks as kleptomania and so on, charming and worth-while characteristics. They work hard

ward. Hospitals should be used only for those who need to be treated for illness, or who are bedridden and need skilled attention.

The care of the frail aged is by far the greatest problem connected with the old which the community has to tackle. They are best in comparatively small units of fifty to eighty, as these groups are no more expensive per head to run than larger institutions, and greater homeliness and individual attention is possible. As much freedom as possible must be allowed, and activities of all kinds must be encouraged. There is no doubt that most old people who are very ... with rheumatoid ... icult to forget ... e encouraged ... has been

treatment but are not yet sufficiently recovered to return ... King Edward's Hospital Fund has financed the establishment of a dozen such homes in the Greater London area, and they are of the greatest use.

Many varieties of homes are now in existence, but there are not enough of any one type. Close co-operation should exist between voluntary and statutory organisations, and easy transfer from hospital to home and vice versa should be arranged, as well as transfer from one type of home to another if there are changes in the condition of the old person.

HAMRIN, GRETA, Stockholm. *Special training for matrons of homes for the aged in Sweden.*

By " Homes for Old People " we mean homes for the aged run by our local social welfare authorities. Medical attendance has to be provided for old people, however, by the authorities that are generally responsible for the nursing of the sick. The care of old people who suffer from prolonged diseases is a bone of contention, because ... with the social welfare authorities, ... ss is of long duration often ... These homes, therefore, must have special wards for such people, and in most cases old people with complicated senility are concerned here. The homes

for the aged of the local social welfare authorities vary very much in size, from fifteen or twenty beds to 100. The usual type of home, however, has accommodation for thirty to forty pensioners.

There are no requiremen[illegible] matrons for these homes. [illegible] been trained annually sinc[illegible] Welfare Association (an organisation of which the municipalities are paying members). The training takes three years. It includes three theoretical courses as well as practice in homes for old people, a hospital, and a mental hospital. Until 1945 the students paid a fee for the tuition given during the courses. Now tuition is free of charge, and the State pays half of the expenses of running the school. While doing their practical work, the students have free board and lodging plus a certain remuneration in cash.

These specially trained matrons are engaged first of all for medium-sized homes with twenty to sixty beds. The larger homes require that the tasks be divided among the following:—

1. An administrator who is at the same time staff manager.
2. A State-registered nurse, responsible for the care and nursing of the aged.
3. A specially trained *chef de cuisine* and bursar.
4. A person specially trained in occupational therapy.

When speaking about homes for the aged in connection with the training of matrons, therefore, I am concerned with homes for at least twenty old people who need to be taken care of, and a staff of at least five people.

What are the tasks of the manageress of a home of this kind? She is called a manageress or matron, and she must have a real interest in old people and should have a personal bent for the task. As the housewife of the community, she must be the buyer and she must be an expert in the equipment of the home (taste and quality) and the problems of the household (nutrition and dietetics). She must accept responsibility for the financial side of the housekeeping. She must be a hostess and represent the home in its relations with the outside world. She must be able to handle staff, and must be able to understand the labyrinth of wages and other agreements. Her task will to a great extent be concerned with nursing, and she will have to answer for the care and treatment of the sick under the supervision of a doctor.

For institutions of social welfare where no specially trained matrons are employed, the persons in charge are often recruited from the corps of State-registered nurses. There we have a choice between (1) those who have received special training concentrating on studies in administration and in making the student fit to be a staff manager and storekeeper, (2) those State-registered nurses who devote themselves entirely to the patients in the wards of the hospitals. It is unfortunate that the latter do not therefore have any psychological knowledge or the social outlook on the problems of

the aged *which is* also necessary, and they have no training in household work.

What we aim at in the training of matrons, therefore, is first to choose suitable persons and, secondly, to see that their minds are directed to the needs and care of the aged. We train them in psychology, psychiatry, and physical nursing. Further, tuition is given in nutritional problems, occupational therapy, and so on. Everything within the scope of this training is aimed at the requirements and problems of the ageing individual.

In Sweden we have now, on the social welfare side, adopted a method of helping old people to remain in their usual surroundings as long as possible. The specially trained matrons whose education has formed the subject of my talk are now to a great extent applying for transfer to this sphere of activity, where their task becomes curative. In all towns an experienced social welfare worker is needed to conduct this form of assistance to old people. A knowledge of the reactions of old people is necessary and an ability to treat them in the proper way and to form an opinion as to the

omes, and an assessment
n of a community is, of
ransfer to a position as

superintendent of the care given to the aged in their own homes is therefore valuable to matrons. From the point of view of recruiting, it is of definite value that there are different fields of activity from which to choose.

STONE, EVELYN, St Louis. *Private nursing homes for the chronically ill in U.S.A.*

THE great progress made in the last half-century in saving life and decreasing sickness has resulted in a much larger proportion of old people living to-day than ever before. Any medical care programme, therefore, will have social and economic aspects that will become increasingly important

The
of our
ill in t
economic conditions, including the trend whereby
of a family seek employment, have brought about the need for both public and private facilities to care for the ageing group.

The private nursing home in America has come into existence within the last twenty or twenty-five years. There are slightly over 20,000 proprietary nursing homes with an average capacity of twenty-five beds, giving an approximate total, therefore, of *500,000 beds.* Lack of geriatric units in general hospitals and of hospital accommodation for chronic disease has encouraged the establishment of these private institutions.

The type of patient suitable for nursing home care is one who,

regardless of age, has benefited from all the services which a hospital can provide, and now needs nursing attention with medical supervision. The nursing homes admit people who are able to pay their way, and people for whom private and governmental agencies have assumed responsibility.

WEIL, J., Cleveland. *The effects of work on the physical and mental health of the older citizens in a home for the aged.*

THE older citizen condemned to or contented with only leisure must gradually lose his sense of self-esteem. It may dislocate his thinking from belonging to society to a withdrawal into a world of his self as a form of compensation. Escape into physical disability, narcissistic trends towards his environment, are symptoms of the ageing person's retreat into psychosomatic ailments. He has lost contact with the normal way of life, by which we mean a well-rounded constructive framework of activities and leisure.

In the social sphere the professions of recreation and group work have reached into all phases of life, and during the last decade the older citizen has been included in these programmes. The oppor- [illegible]

or as a member of the household with his children. Homes for the aged, nursing homes, boarding homes, and all group settings of this type usually breathe the havoc of inactivity and the feeling of uselessness and resignation.

Indeed, this was the situation in our home, too, about fourteen years ago, but a fortunate coincidence helped us to lay the foundation for a service which gradually led to our present sheltered workshop programme. A s [illegible]
to our home beca [illegible]
in business himse [illegible]
from now on to [illegible]
to him, especially after being told that his shoemaking machinery was to be disposed of as scrap. We changed our minds, therefore, and decided to instal his machinery in our basement, and this shoemaker was then able to continue with his life's work. From this time onwards the work programme was established as an accepted factor of Montef [illegible] tailor's shop, a
candy and cigar [illegible]
was paid accordi [illegible]
were placed in a general fund for the coverage of overheads. An executive committee of the residents decided upon the type of work and upon the contacts with local manufacturing companies.

Apart from the occupational and monetary value derived, the restoring of physical and emotional health has been immeasurable.

Minor ailments have become less serious and of shorter duration, and there has been a saving on hospital days, services, and medication.

Approximately 60 per cent. of our population of 130 are gainfully employed in various projects. About forty are working in the various workshops—a good number of them come in wheel-chairs, or assisted by crutches, canes, or tripods. Others are engaged in clerical work. No resident is allowed to work more than five hours a day, and the recommendation for workshop activity has to be approved by our doctor. The workshop activity is voluntary and the resident may make use of his earnings as he wishes, as long as these earnings do not exceed 20 dollars per month. The workshop programme is now under the supervision of a full-time employed workshop supervisor, and the programme maintains itself by 50 per cent. The emotional and social values are intangible and therefore cannot be calculated in dollars and cents. They are immeasurable in human dignity.

BARTLETT, LUCILLE, Chicago. *A home for the aged makes use of community resources.*

needs of people is through a combination of voluntary privately financed organisations and public agencies. *There are a variety of* agencies for the referral of aged persons who need or want domiciliary care, and we are continually surprised by the unexpected manifesta- ... unsolicited from groups ... needy ... and

administrative policy by such agencies as the Chicago Department of Welf... resources provide opportunities for participa- ... affairs. These resources ... are part of the community ... dances for the aged were

and other social groups are encouraged to have their meetings in the Home.

Homes that admit physically and mentally alert residents must provide outlets for normal physical and mental participation in community affairs if the stigma of entering an old age home is to disappear.

DISCUSSION

In the discussion, B. PLISKIN (Israel) related his own experience of four years' work in the care and rehabilitation of the aged in Israel, as a representative of a voluntary agency.

During the mass immigration into Israel there were 720,000 migrants, 6 to 7 per cent. of whom were over 65 years of age. Many arrived in a very poor state of physical and mental health, and were in need of rehabilitation. Twenty-four institutions have now been established which provide accommodation for about 2,000 aged migrants and home and hospital care for about 700 patients. The homes are unfortunately large, each providing for 100 to 200 residents, but there has been a vigorous attempt to establish in each home a new community. Many of the occupants are now healthy and some are independent; 1,075 of them engage in occupations and services for the homes, and the products made by the residents have a good reputation and provide a source of income.

There is sometimes a resident doctor, and there are always social workers on the staff. The same organisation is introduced in nursing homes and in homes for the chronically ill. In this way it is hoped to prevent physical deterioration, and a two-way traffic has been established between the institutions and the nursing homes.

H. OLSEN (Denmark) referred to Mrs Stone's paper on medical care in homes for the chronic sick. The Psychological Department of the Municipal Bispebjerg Hospital, Copenhagen, recently saw visitors to the senile patients in the geriatric ward of the department. The visitors were registered day by day over a period of six months as to the number of patients they visited and their relationship with the patients.

These chronic sick patients received on an average 0·86 visitor per patient per day. Nineteen per cent. of the visitors were contemporary relatives and only 4 per cent. were other contemporaries. Seventy-six per cent. were younger relatives and only 0·3 per cent. were other young persons. Only 8 per cent. of the patients had no visitors at all.

CHAPTER XV

COMMUNITY ACTIVITIES

KUPLAN, L., Sacramento. *The community and the senior citizen in California.*

[illegible] that it is possible to develop [illegible] intensive [illegible] public and voluntary [illegible] consider the problems [illegible] community, [illegible] each community had [illegible] that the role of government was to advise and to assist [illegible] of this conference was that a committee [illegible] Departments [illegible] part- [illegible] ities [illegible] there [illegible] which were [illegible] ailed [illegible] ts stimulated the establish- [illegible] almost every instance the [illegible] included leading business [illegible] representatives of public [illegible]

[illegible] There are individual clubs, but there had not [illegible] l approach towards meeting the needs of the entire group. This one-day meeting provided an opportunity for more than 200 retired persons to meet specialists in the various fields to discuss with them some of their needs. The major subjects discussed included the economic problems of retirement, the better use of leisure, health, education, and [illegible] relationship. As a result of this meeting there has been [illegible] on ageing.

[illegible] aimed at informing [illegible] ageing and providing educational opportunities for [illegible] selves. The education of the public is carried on through radio and television programmes and the press. The schools of California are providing educational opportunities for elderly persons. Some 400 school districts have adult education programmes which are used by a large number of people over 50 years of age. In addition, there are twenty-five school districts which offer courses designed to assist the older person in his adjustment to retirement. Many schools are

offering special lecture series on the problems of ageing, and the first series of lectures was [illegible]

The second lecture series [illegible], and a third series is now being planned which will be devoted to such problems as managing one's money, supplementing income, and how to make the better use of existing income from practical knc[illegible]

[illegible] eds of older pers[illegible] Voluntary Ser[illegible] for older people. It is a one-storeyed building and the apartments are rented only to persons with limited means. Adjacent to these apartments is a centre which provides a number of social and craft activities for the tenants and for older people in the neighbourhood. The [illegible]

[illegible] offe:, [illegible] The programme included social affairs, games, craft work, dramatics, music, outings to parks and other places of interest.

These and mar[illegible] offered to our senior citi[illegible] ealth programmes for tl[illegible] and numerous commun[illegible] tizen has a role to play [illegible] communities can remain healthy only so long as every citizen plays his part, and to that end we encourage our older persons to contribute, to assist, as well as to receive their aid.

There is always some lack of voluntary workers, and we see the possibilities of retired persons themselves providing an immense reservoir of voluntary help.

I have tried in this short paper to indicate the great activity and the great enthusiasm which is being made in California in this field of social work. It is successful because of the co-operation of people and organisations, and because of the clear demonstration that the public and the voluntary agencies can make together to meet the challenge of our common problems.

LANDAU, GERTRUDE, New York. *The restoration of group esteem through social group work.*

EXPERIENCE at a day centre for older persons has made us aware that it is in self-esteem that the older person registers his most acute reactions to advancing age. People gain and establish their self-esteem from standards incorporated in early youth from parents and environments, standards which are modified, augmented, and adapted through life. In adult life the sources of satisfaction come from jobs, mates, family, friends, from relationships, achievements, and sense of belonging. But when an older person reaches the time

of retirement, the occupation which filled his day has gone. His circle of friends has narrowed and his contact with the community has diminished.

The William der folk located in New al group workers who make a conscious effort to help those men and women aged 60 to 90 to gain satisfaction through personal relationships and activities. The programme is supported and sponsored by the New York State Department of Welfare in co-operation with a voluntary committee of lay and professional members of the community. The centre is equipped with a lounge, a workshop, a cafeteria, library, classroom, and studio. Our current membership is 850, with an average daily attendance of 250, and during the ten years of its existence we have served over 1,500 older people.

Because of the large number who use this centre, we have been interested in its effect on the rank and file member who, after all,

sat in the same chair seemingl ments and rarely engaging in to empty and clean an ash tray to show a newcomer round the centre, which he was pleased to do, and eagerly explained and praised what he was showing. In brief, this small act of emptying an ash tray enabled Mr B. to acquire a sense of belonging to the centre.

The success of membership of this centre depends on its relationships with others in the community. At a city side-hobby show only 10 per cent. of the members were actual exhibitors, but more than half of the members visited the show clearly to share in the prestige of identification. For such centres the social worker is needed who gives impartial attention to each individual, who recognises any and who is

who is no longer fully occupied.

KAPLAN, JEROME, Minneapolis. *The significance of group activity on psychogenic manifestations of old people.*

ALTHOUGH we are not able to distinguish all the factors involved in emotional degeneration, it appears that neurosis might be more common with the aged than any other age group. There is certainly an increasing for those over 65 years of ag years of empirical 6,000 people aged adult

groups, and these observations were made through the group work of the Hennepin County Welfare Board, Minneapolis, Minnesota. From these 6,000 old people there has not been a single admission to a mental hospital during this time. That suggests that group participation is a most important means for aiding the old adult to maintain a proper balance for himself. Too many old people who have retired appear to be deteriorating in social consciousness, physical appearance, or emotional stability for lack of some meaning and pleasure in day-to-day living. Group activity helps to prevent the need of mental hospital treatment and certainly reduces the number of requests for medical assistance. My evidence suggests that an environment in which older people can meet their own needs in their own way through satisfying group experiences is of very real value.

JAMES, BERTHA, Chislehurst and Sidcup. *The part played by voluntary organisations in welfare work for the aged in England.*

[illegible]

represent a type of work being done by voluntary societies for the aged and particularly for the elderly folk still able to live in their own homes.

This work is in the main through local Old People's Welfare Committees, of which there are now in existence some 1,085 local and fifty-six county committees, with more being founded every year. The work of the Old People's Welfare Committee is mostly d[illegible]

[illegible]

National Association of Mental Health, the local council, the Council of Social Service, Inner Wheel clubs, the Soroptomists, individuals with special knowledge and experience, club leaders, the [illegible]

trying to start; and then finally I am going to say a word about [illegible]

[illegible] meet weekly. In many [illegible]ly, and some, I believe, [illegible]ship and a wide variety of activity and interest to some 1,000 members. Birthdays, golden weddings, and Christmas are celebrated with appropriate parties. Outings continue throughout the year, and include visits to theatres,

the seaside, the country, places of interest, including factories, the House of Commons, the Royal Mews; and one of our most interesting visits was to the Ovaltine factory. Many interesting personalities from overseas have visited our club and given us short talks.

Some of [illegible] in games, ar[illegible] inter-club c[illegible] exhibited, and a great ingenuity of ideas in the use of material and a high standard of craftsmanship makes this event a great success. For the first time this year an inter-club music competition has been held. Each club sang Brahms' "Cradle Song" and a song of their own choice. Our Member of Parliament presented a challenge cup to be competed for annually. Our members very much enjoy wearing our national blue forget-me-not badge, and when I go to other parts [illegible] schemes. This year about 120 of our members spent holidays at Bognor, Bexhill, and Eastbourne. The members each pay £3. 3s., and they do have a very good time. A member of the committee goes to the resort beforehand and tests the beds, talks to the landlord, and explains if one of our members is in special difficulty. We find our holidays by the sea a tremendous success.

In the last four or five years we have had harvest services in all our clubs, and gifts of fruit, flowers, and vegetables were received from many churches and from the schools. That is always a very happy afternoon. Our members decorate the halls with apples, marrows, autumn flowers, and so on, and generally one of the local [illegible] little service. The old people [illegible] some essays written by club members and we had them bound. We find there is nothing like a little prize, and we encouraged the members to write these essays. These essays touch on clothes, wages, food, family life, farming, changing conditions, shopping, and many other activities during the last eighty years. Many items of local history and interest as well as social history are included in this collection.

We have an inter-club bulb competition. Club members plant hyacinths in the autumn, and a competition is held in February of each year, where the beautiful display is keenly contested and much enjoyed. Four challenge cups have now been presented for this event.

We have also what we term services for the elderly. We have hospital visiting, and then we have a panel of visitors who visit the elderly in their own homes. I think this is one of the most important services. It is difficult to find the lonely because they are so independent and they will not reveal their loneliness to anyone. They prefer to suffer in silence, but by various means, such as through

the churches, the home nurses, the home helps, and so on we find the *lonely*. Then we have library facilities. Our librarian provides a *shelf of* books on a variety of subjects, and we have a magnifying *glass in the* library for those who need it. Librarians are pleased *to visit* clubs and talk about the facilities for borrowing. Librarians will help elderly borrowers between 1 and 3 o'clock *in the choice of* books. We have an experimental laundry scheme arranged in co-operation with the hospital and the local health authority. Soiled [illegible]

[illegible] in any way whatever, and this was a great success. People got to know each other, and they pooled ideas.

We encourage club members to take an active part in the life of the community. They can, and do, take stalls and prepare teas at church fetes, bazaars, etc., collect strip pennies for the Children's Society, take tickets for whist drives, concerts, and so on for charitable purposes. They look after their grandchildren and sick and aged persons, and sometimes they act as "sitters in" for young couples when they go out at night. They make scrapbooks for fever hospitals and children's wards. They sell flags on Alexandra Rose Day. They love to be asked to help.

With regard to the future, I feel there is an opportunity to encourage closer co-operation with the education authorities. Certain secti[illegible] Act have not yet been implemented, largely beca[illegible] inevitable. [illegible] an enormous [illegible] elderly people.

BLYTH BROOKE, C. O. S., London. *Sheltered workshop in a London borough.*

In the part of London where I work, sociological changes are [illegible]

hope and no interest. Useful work should therefore be made available to those ageing persons who need it. It must be remuneration in order that its value to the community may be fully appreciated

the capacities of those undertaking them. Remunerative employment in a suitable centre also provides for social contacts during work, and it carries with it obligations and privileges both of which are invaluable.

The scheme was started in Finsbury early in 1951 to provide a work centre for men over 65 and women over 60 years of age. The work provided has consisted essentially of all kinds of outwork carried out on commission for various commercial firms and the making of goods for sale either to the trade or to the public. No work of any kind has been undertaken unless we feel that it can be well done. For this reason it has been possible to preserve the confidence of all firms who have entrusted the scheme with commissions as well as to verify the faults of the workers themselves.

The wide variety of types of work undertaken are illustrated by the following selection :—

1. Packing corn and bunion pads—fifty gross per week.
2. Assembling the parts to form drop bottles—twenty gross per week.
3. Making up 15,000 wallets of thin cardboard.
4. Re-indexing the Public Library
5.
6. efrayed by the Old People's Welfare Committee.

A fair commercial rate has been charged for all work done and articles sold, and care has been exercised to avoid exploiting the elderly by undercutting the market on the one hand or exploiting the charitable disposition of firms or of the public by overcharging on the other.

In this connection I think I should point out that this centre has full trade union support, and pensioners are at the moment allowed to earn up to £2 a week without any effect on their pensions; and if they are receiving supplementary pensions from the National Assistance Board, they are still allowed up to £1 a week without it having any effect upon their pensions.

Equipment has been mainly of the simplest kind, although as the scheme advanced, one, and later a second, sewing machine was purchased, and certain firms have loaned pedal-operated machines for cutting thumbholes in the lids of boxes for inserting eyes into the laces of garters.

At the present there are working seventeen men—their average age is 75 and on an average have been attending for fourteen months —and forty-six women with an average age of just over 71, and on an average having taken part in the scheme for just under two years.

The oldest lady is now over 88 and has been working for twenty-two months. Rather more than thirty men and women have left the scheme after an average period of employment of one year and three months. Ten because they moved out of the district; twenty because of diminishing strength or illness; and a few because, having regained confidence in themselves, they felt able to undertake ordinary work under less protected conditions.

A flat rate of 10s. per week has been paid to everyone irrespective of output. It may be that some have earned rather more, but the average output of work, especially among the older group, is below that of a younger person, and in consequence the actual labour yield

and contentment for which it is responsible is evidenced by their cheerful chatter at work as well as by their statements. The self-esteem engendered is shown by their regular attendance, even in the worst winter weather.

The centre has been accommodated hitherto in premises which consist of a converted house with two rooms on the ground and two upper floors. These premises are most unsuited for the purpose, but when the experiment was inaugurated, no place more readily adaptable was available. But owing to the remarkable success which has been achieved, the Committee of Management felt justified in

KEELING, DOROTHY C., Sheffield. *Advisory services for old people in the United Kingdom.*

At the beginning of the Second World War the Citizens' Advice Bureaux were set up in more than 1,000 cities and towns both large and small, to provide information and advice in the many difficulties brought about by war conditions. During the war these bureaux were subsidised by central government grants, and when that ceased most local authorities accepted responsibility for some of their expenses. During the last fifteen years the advisory and case-work services in the country have developed considerably. The bureaux have always remained independent of statutory control and a large number of their workers have been volunteers, supplied with regular information and training courses by the N

Council of Social Service, which still serves as headquarters to this particular service.

[illegible]

people's difficulties are in some ways similar to those of other sections of the communities. Like their younger brothers and sisters, they suffer from acute housing shortage, their family relationships are often strained, and they often face involuntary unemployment. But there are other difficulties peculiar to the aged, and the elderly need more facilities for advice and help than was the case a generation ago. To-day life is more complicated than before, and the elderly are less well educated than are their children and grandchildren. Moreover, families are smaller and more mobile, and in consequence people are apt to become separated from their relations, who are no longer at hand to help them.

Anxiety and worry are very prevalent amongst the elderly, large numbers of whom suffer from inadequate incomes. They may experience difficulty in obtaining a varied diet, sufficient fuel, and adequate clothing and bedding. They are more prone to illness and accident than are younger people, and old men are seldom equipped either financially or in other ways for any kind of occupation once they retire from their life work.

Here are a few examples, taken from the current file of an Old People's Department of a Council of Social Service, of the kind of difficulties in which old people need help:—

1. Mr and Mrs A., aged 73 and 78, are a very respectable couple who have lived in the same house for twenty years. They sought help to restrain their neighbours from trying to poison them by injecting an evil-smelling gas into their house. Their fears turned out to be groundless, but a weekly talk with a sympathetic listener is doing much to help them to realise that they are mistaken.

2. Mrs B., aged 81 and house-bound, was anxious to make a [illegible] thank-offering for

[illegible]

pension from the National Assistance Board ceased on her re-marriage. The marriage was unsuccessful, and after four months the couple separated. An appointment was made for Mrs C. to see an officer of the National Assistance Board, and the full supplementary pension was restored.

4. Mrs D., aged 75 and very deaf, lived alone except for her dog. When her gas bill was paid she found she had only 3s. 9d. left towards the cost of her dog licence, which was 7s. 6d. A kind friend found the remaining 3s. 9d.

5. Mr E., aged 68, was bothered by abusive letters from a neighbour demanding payment for services to his deceased brother, for

which no agreement had been made. The neighbour was seen and the old man's circumstances explained to her. She understood and agreed to let the matter drop.

6. Mrs F., aged 76, was greatly worried by her step-daughter's request to receive all her deceased father's possessions, and by her generally unpleasant behaviour towards her. After a talk with the step-daughter she agreed not to worry her step-mother any more.

These examples indicate the kind of anxieties which affect the elderly—dealt with speedily, calm and content can often be restored; left alone they may fester and grow until they lead to mental instability, which is easier to come by than to cure. Help is often needed in technical difficulties—for example, the payment of rates [illegible]

children.

In this country advice and case-work help everybody, and the elderly are provided for in the following ways: (1) By friendly visitors who call regularly in their homes, gain their confidence, and ensure that they receive all the help to which they are entitled; (2) by visitors in hospital who help to prepare the way for old people to return home when they are fit to do so and to deal with matters relating to their home affairs; (3) in Citizens' Advice Bureaux or in old people's departments of Councils of Social Service or Family Case-work Societies; (4) by talks in clubs for the aged on such subjects as the function and scope of the National Assistance Board and how to make an application for supplementary pensions or other grants for special needs, the prevention of accidents in the home, the home-help service, food recipes and how to make them.

It is of the greatest importance to advertise as widely as possible the help that is available and where. Slips in the relief cards issued by the National Assistance Board and in library books, notices in the doctors' surgeries are all useful, but it is still distressing to find how difficult it is to make sure that those in need of help know where to obtain it.

VICKERY, FLORENCE E., San Francisco. *A study of personal counselling needs of senior citizens.*

Early in its history the San Francisco Senior Centre, a recreational and educational centre for men and women over 60, realised the necessity of having on its staff a trained counsellor. We were working with individuals who had reached a period when life adjustments became critical and it was only to be expected that many of the individuals would require help. The counsellor soon became

aware of the lack of adequate services for elderly people in the community. This concern was taken to a community committee on the problems ... der way to learn from existi ... nature and ... for older ... fessional helping service ... ls, which seeks to enable ... ms to use his own inner ... ailable to him in the community.

The seventeen community agencies which participate in the study include family welfare, medical social service units in hospitals, social and recreational agencies serving older persons exclusively, ... units of the Veterans' Adminis- ... vorkers in these agencies ... elling interests with clients ... erviews were obtained, and ... ese five general categories: ... (2) financial, (3) legal, (4) medical, and (5) ... ases there were two groups—those with only one problem and those ... volved in a number of problems. ... em cases reported, and these had been known to the agencies for only a short time. For these clients the agencies felt that they could give the needed counselling and service in 80 per cent. of the cases, that they could refer to other agencies an additional 8 per cent., and that for over 2 per cent. there were available no community resources for meeting the problem. A total of 2,785 specific problems were identified in 883 of the multi-problem cases, which is an average of 3·2 problems per person. The largest number of problems, 27 per cent., fell within this personal-social category. Minor problems account for 25 per cent. of the total, financial 24 per cent., environmental 17 per cent., ... multi-problem cases the agencies ... 60 per cent. ... , or could be, ... erred because ... In addition, 8 per cent. of the cases were not referred for other ... sons.

Many of these clients were unwilling to recognise their problems as those which required skilled case-work, or at least they were not ready to take steps of going to another agency at the time of the study. One is impressed with the number of problems presented that were beyond the possibility of solution by the effort of the individual older person or even his family or friends. Most of these ... the initiative in supplying ... mple, environmental pro- ... need such specific aids as ... ousing in the terms of their

physical requirements, or other household help. Fourteen per cent. of the problems involved negative feelings and attitudes about self and strained relationship with relatives and others and the need for social contacts.

Two very *significant findings were revealed by the study.* *The* community has a long-established and well-staffed family and children's agency. One would expect that many of the older people

agency. Furthermore, the study revealed that not one case of the total 1,042 was found in which service was given by two or more agencies. Because so many individuals had combinations of problems, it is surprising that no case was reported by more than one agency. The fact that 49 per cent. of the older people interviewed were living alone is significant, because there was no one to help that elder person or perhaps to encourage him to follow through his applications. Even lack of physical energy to get him around the various unfamiliar places in an area can be the reason why many older people do not follow up their applications. *Mental decline, forgetfulness, timidity, and withdrawal have been* characteristic behaviour of many elderly people.

Through our studies of the counselling needs of older people we have learned that we must develop a better co-ordination among agencies who serve old people and that a more extensive follow up is needed to ensure that their questions are answered. Our study has also revealed that there are as yet no community resources available at all to deal with 15 per cent. of the problems that older people have. These include the need for home-maker services, protected living arrangements of moderate cost, and such health needs as dentures, hearing aids, and glasses. The need of older *people for opportunities for social contacts with their contemporaries* has not been met in most communities, and the establishment of recreational and educational agencies to meet social and emotional needs are a relatively new development.

KOUNTZ, Mrs W. B., St Louis. *The role of club women in gerontology.*

WOMEN are living longer than men. They outnumber men ten to nine in the 65-year-and-over group in the United States. More than half the women past 70 are widows. Many of these older women are financially dependent upon relatives or the public for assistance. Other women hold large amounts of corporate wealth. With this goes great responsibility and also great opportunity for good.

The General Federation of Women's Clubs added the division of gerontology to its programme four years ago. It seemed

[illegible]

was put on study, research, and action. Each year more clubs, including Junior Clubs, have added programmes on gerontology to their year's study. Many club women have expressed appreciation of these programmes and the better understanding of the old-age problem gained from them.

Many Missouri clubs have started projects in the local "rest homes." This has not only brought cheer to many lonely people but has helped raise the standards in some of these homes. These are some of the things club women can and are doing:—

1. [illegible]
2. [illegible]
3. [illegible]
4. Promote adult education programmes.
5. Organise visiting services for shut-ins
6. [illegible]
7. [illegible]
8. [illegible]

WILLIARD, HELEN S., Philadelphia. *Occupational therapy for elderly persons.*

OCCUPATIONAL therapy in the United States now requires that the therapist be a college graduate and be trained in many fields. She is taught to consider the patient as a whole, to know his social and [illegible] his physical and psycho- [illegible] ost [illegible] he [illegible] ly person may well be made in the earlier days of hospital treatment. Far too often in the past the capabilities of the aged have been underestimated, and the individual has too often been left to deteriorate into senile decrepitude. It may be a really great effort for the therapist to wheedle and cajole a patient in an endeavour to stimulate his rehabilitation and to be in a position to care for himself again.

But the primary purpose of occupational therapy is to return the patient to his normal activity under the best possible conditions. Many of the gadgets or pieces of equipment used in self-care have been evolved by the occupational therapist, who is employed frequently in the continuation of the treatment of the patient in a sheltered workshop or under home conditions. More occupational therapists in the United States are employed in mental hospitals than in any other single phase of the profession. A hobby or avocational pursuit is no true substitute for work. However, if it serves as stimulus to the individual in arousing and maintaining

interest, it may serve as a wholesome and valuable substitute. Sometimes real talent previously unrecognised may be discovered, and in many cases the period of economic independence may be extended. Occupational therapists are now being employed in homes for the aged, and there is an increasing demand for more to adopt this type of work.

FERGUSON, Rev. Canon E. B., Dallas. *The religious basis for the interdependence of the disciplines concerned with ageing.*

WHAT I have to say is a word of recollection of what it is that we are about. My recollection proceeds from the fact that human sciences at their highest and best are addressed to the conviction that the most unworthy appearing instances of the human species are of supreme worth in and of themselves; but you cannot derive this principle from the experimental sciences or arts. It is a theological principle which forms the bedrock upon which our Western civilisation is built.

In gerontology are we not primarily concerned with the ageing of man, and with means whereby men may function within their true capacities? If men are no more than complicated packages of needs for temporal satisfactions, the community of mankind can be no more than an aggregate of these packages, and there is little point in bestirring ourselves as if these needs and desires constituted some sovereign, supreme, ethical claims upon us. The facts of life,

they are wise, holy, virtuous, or well-behaved, for all mankind neither ever was, nor ever will be so . . . his duty of benevolence is founded upon such reasons . . . as have no dependence upon the quality of persons." We need to remind ourselves again and again that the chief end of man is neither

the guise of " retaining h

mortal sentence. Rather

destiny in union with his

this world will always be a tragic place, because it is the field whereon are met divine Grace and human hope, and into which death comes as a real and radical crisis. In such a world, Redemption enters, not as salvation in terms of temporary integration of human

the redressing of the many needless torts inflicted by our culture upon the ageing. But it is of critical importance that we discriminate rightly between the categories of needs to which we minister. We

are profoundly and rightly concerned to relieve the animal grievances of boredom and triviality inflicted on men in their later years; but the bitterest of the grievances of ageing is a spiritual one. It is the ultimate grievance of being denied the right to participate as a member of "the beloved community" in the Divine plan of redemption "for this world and the world to come." It is to the maintenance of the primacy of this conception that religion addresses itself. She claims this as her right, not because she is the fountain from which all physic has sprung, nor yet from her position as the historical womb and matrix of all the healing arts, but because of her unique vocation to speak, under God's judgment, as the champion of man.

CHAPTER XVI

EDUCATION FOR LATER MATURITY IN THE U.S.A.

DONAHUE, WILMA T., Ann Arbor. *Introductory remarks.*

This session is unique in that it is the only one to which, apparently, only Americans are contributing. I think that it reflects a development in the United States which has not yet taken place to any measurable extent in the other countries of the world. The members of the clinical section have been reporting upon their search for methods of treating the physical and mental consequences of growing old; the social workers have been concerning themselves with the [illegible] old age. [illegible] the educa[illegible] adjust to the inevitable consequences, both biological and social, of becoming old, and also of assisting that individual in making the most of his abilities and of his previously undeveloped potentialities.

It is our great fortune this morning that we are to open this meeting with an address from Professor A. J. Carlson of the University of Chicago. It is significant that a man who has spent his life in a distinguished career in physiology should be willing now to turn his attention to reflecting upon the methods by which we can bring education into play in assisting this physiological-biological organism to attain full, fruitful living until the end of its life.

CARLSON, A. J., Chicago. *Can continuous adult education add more life to the later years?*

As I know man and nature, the answer is yes. We would, and should, inaugurate a system of continuous and real—that is, factual—education throughout our adult life for all citizens as an important element in preparation for their senior years and so-called retirement. Such education, if started after we are 65, is "too little and too late"; bu[illegible] render fut[illegible] matter of [illegible] and violence.

This continuous and factual adult education on the nature of man and his physical, social, and economic environment calls for assistance and guidance by the experts and leaders in all these [illegible] history, [illegible]

This local society points out that practically all of our [illegible] citizens, including educators, physicians, sociologists, and economists, should be concerned with a continuous adult education on the nature of man and man's environment.

In the United States the name of the old Federal Department of Health has lately been changed to the Department of Health, Education and Welfare, but this Government department has not yet inaugurated the kind of continuous adult education on the nature of man and the nature of man's environment that I have in mind. One of the basic individual human rights in a democratic society is an opportunity to earn a living. This right is seriously interfered with in our industrial society by the general practice of compulsory retirement of workers at 65 to 68 years of age without reference to the physical and mental health of the individual worker.

Age itself, as we know, is relatively unimportant as a barrier in learning. I should be an example of that for I am still learning fairly well at 80. What is of great significance is the combination of basic capacity, energy, experience, and motivation which, with proper guidance, can lead to improved skills, better understandings, increased knowledge, alteration of values, and an enrichment of adult life. These things are possible when adult education is meaningful; when it honestly evaluates adult motives and needs; when it recognises individual differences in capacity, background, and experience; when it gears itself to the specific task of breaking down the inhibiting factors and harnessing the facilitating forces which arise from the individual's years of varying and conflicting experience; and, finally, when it accepts the fact that learning is a life-long process for each individual with a unique pattern of mountains, plateaux, and valleys.

In [illegible] should inaugurate a system of conti[illegible] life for [illegible] senior [illegible] would provide a more intelligent guide to human evolution, it would keep alive our human curiosity, and we would secure profound pleasure from the greater understanding of man and the universe, even after physical impairments confine us to the rocking chair or the bed. Such education, so far as I know, has not really been started in any country in the world. So far, our attempt at continuous adult education has not reached a sufficient number of our adult lay citizens.

KAPLAN, O. J., California. *Communication of health knowledge to older persons by radio and television.*

In a series of studies made in San Diego, California, we have found that in our city the older people are inferior to young adults in health knowledge, attitudes, and behaviour. Accordingly, we have given attention to the problem of correcting this condition. This complex problem has many aspects. In the brief time permitted I can present only the barest outline of our procedure and conclusions. Moreover, I wish to emphasise that our results are specific to the

time at which our observations were made, and to the American community in which the work was done.

In the United States radio and television sets are so widely held that they have become important instruments for communicating knowledge as well as for providing entertainment. In the city of San Diego, a city of 450,000 persons, almost every household has at least one radio, and three homes out of four have television sets. It is believed that within a few years almost everyone will have a television set. This paper is addressed to the question, "Who listens to or views gerontology broadcasts?"

In an effort to assess the audience size and characteristics of a radio gerontological programme, a series of thirteen fifteen-minute lectures was developed. Each lecture was recorded on tape by a man of eminence in the field of ageing. The series collectively was known as "Your Life After Forty." Beginning on 28th April 1950, and continuing each Friday evening thereafter, a programme was broadcast over a popular San Diego station. A city-wide sample survey, involving 1,600 interviews, was undertaken late in May 1950 with reference to the radio series. The dwelling unit was the basic unit employed in the survey.

The city of San Diego is divided into ninety-one census tracts, and very accurate information exists on the numbers of units in each tract. Each tract was properly represented in the sample, and within each tract units were selected at random. Respondents were asked a number of questions about the gerontological radio programmes. One of the questions was, "Have you listened to any of the programmes in this series?" Thirteen per cent. of the adult population stated that they had listened to at least one of the programmes. If the survey had been made later in the series, no doubt the percentage of listeners would have been higher. There were more than twice as many listeners under 60 as over this age. It should be noted, however, that persons over 60 constitute less than 20 per cent. of our adult population.

Within the various age groups there was a relationship between age and listening—the older the age group, the higher the percentage of listeners. Although much publicity was given the series in newspapers, by mail, and in other ways, most listeners stated that the programmes first came to their attention as a result of chance dialling. Newspaper publicity, however, was an important factor in building the audience. Respondents were asked to indicate the topics most appreciated by them. The topics most frequently mentioned were nutrition, mental health, and medical problems of various kinds.

Many of the persons under the age of 40 who described themselves as listeners were concerned about older relatives. Some said that they were seeking information that would be helpful to them in their later years. A special effort should be made to increase the number of young adults listening to or viewing gerontological programmes, for three reasons: (1) Young adults often have chief

responsibility for the care of elderly persons and they need to be provided with a basis for intelligent decisions; (2) they are often in a position to influence greatly the attitudes and behaviour of their seniors; and (3) preparation for old age must begin early.

More recently we have been engaged in a television programme on ageing. This programme has been a midday presentation of thirty minutes' duration. Although the evaluation of this programme [illegible]

there have been a few occasions when the entire programme was devoted to a single subject. Models, films, pictures, drawings, and other visual aids are employed whenever possible. Guest speakers are invited at every opportunity. The programmes are informal and unrehearsed. Among the topics which have been covered are heart disease, cancer, arthritis, care of the aged in various foreign countries, housing, mental health, dental problems, art and the [illegible]

communication are of the public service type, that is, they are non-commercial. The San Diego County Medical Society has permitted its members to appear on our medical programmes, and they have been of great assistance to us.

Many difficulties, of course, stand in the way of the fullest exploitation of radio and television. Our studies show that older people are less likely to own sets than young persons. However, even to-day much of the entertainment enjoyed by older people in the United States is provided by television. Being less mobile, they tend to use their sets longer each day than their younger associates.

There is mounting evidence of the superiority of television over radio in the communication of knowledge and ideas. Sustained by two senses, television has a marked advantage over radio. Television sets will increase in numbers throughout the world and eventually will be available to most older people. Here is an instrument which can play a solid and recognisable part in the improvement of the well-being of our aged citizens.

BOND, BETTY W., Minnesota. *Health education for organised groups of older adults: a governmental health agency programme.*

In Minnesota we have been engaged in a research programme testing the effectiveness of mass communication as opposed to group discussion techniques in health education and chronic disease. We

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topics for use by these clubs, and the health educator remains responsible for the educational methods. Subjects for discussion include nutrition, safety, mental health, and the role of the older person in the community. Since we are unable to reach our large rural population on an individual basis, our present plans provide for the mailing of copies of the discussions at clubs to centres in these sparsely populated areas.

In addition to presenting health information in these discussion units, we encourage these groups to utilise the resources available to them in the hope that they will then find their own leadership within their group.

We believe that this is the first time any State Health Department has attempted to develop discussion plans of this type. We think they are valuable in adult education and particularly with the older age groups.

REALS, W. H., St Louis. *Programmes for the ageing in American universities.*

In 1949 the New York State Joint Legislative Committee surveyed 486 colleges and universities and found that 463 had no specific

has been with the younger and middle-aged adult and the relatively fewer older persons who attend. There has been almost nothing, until within the last six or seven years, designed primarily for the older adult. When I surveyed last year the 136 evening colleges

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Boston University a few years ago.

The present study indicates increased emphasis during even one brief year, and a study of the questionnaire results, together with a study of the large number of brochures, course outlines, and research articles convinces me that the problem of ageing and educational provisions for the older adult have become a definite and increasingly continuing concern of universities in the United States.

ANDRUS, RUTH, New York. *The Cold Spring project: the value of a small residential group in the study of change and growth in college graduates over 60.*

THE Walt Foundation was chartered in July 1951 by the Board of Regents of the State of New York. The Cold Spring Institute, which it sponsors, is located on 160 acres in the Highlands of the Hudson River. The Institute is in reality a research project, not only to discover the possibilities of change and growth in people over 60 but also to discover what are the elements through which the potentialities of the individuals may be developed.

During the first year of this Institute a group of eleven old people (ten women and one man) were in residence for eleven months. They came from widely separated parts of the country and had varied economic and social backgrounds. The age range was from 60 to 80 years of age, the median falling at 69. The group was above average in mental ability and in the number of interests shown and in willingness to co-operate.

A committee of consultants in various fields provided an advisory group for research and programme evaluation. The philosophy of the Cold Spring Institute is that productive change and growth are possible throughout life. Lectures and discussions on different subjects were common, rhythm had as its purpose the reactivation of the enjoyment of their bodies, and there was remedial work to counteract the physical degeneration which so often results from inactivity. Creative writing afforded opportunity for communication of ideas, and there was a broad programme of health supervision provided by the Institute which included complete medical examination at the beginning and end of the year, with extensive laboratory tests and psychological examination.

work together

develop their

own creative interests, but in no sense was any work required, for it was felt that a maximum benefit could come to the registrants only through freedom to explore and choose various avenues of expressing themselves.

The most striking change which occurred during the group's residence at the Institute was that the registrants felt more alert, more vigorous physically and mentally. Their self-esteem increased,

specific subject matter must come from the needs of the group as they are expressed, and the level of presentation must be in terms of the manner and rate at which the material can be assimilated.

DONAHUE, WILMA, Michigan. *Action programme in education for later maturity.*

THIS paper is a report of a two-year experimental project in adult education for older people. Objectives of the experiment were to demonstrate to older people and to the community that, given opportunity, older people will develop leadership roles in activities

students progressed from a study of the nature of the problems of later maturity and of techniques for adjusting to these problems,

for directors and social workers in homes for the aged, and for community organisers interested in making use of the residual skills of the older segment of the population.

CHAPTER XVII

GENERAL ASPECTS OF AGEING

SIMMS, H. S., and BERG, B. N., New York. *Factors controlling longevity.*

I THINK it will be agreed that in the field of research on ageing there is a great deal of confusion on certain aspects of the subject. That applies particularly to the question of longevity and the relation of age to longevity. People ask me frequently what is the relationship between rats and humans in regard to the rate of ageing—*e.g.*, how many years in a human corresponds to a year in a rat? That is a question which I cannot answer. I do not think anyone can answer it, and I doubt whether there is a simple answer to the question of the relationship of one species to another in regard either to potential longevity or [illegible]
before sexu[illegible]
much in rega[illegible]
one species [illegible]

Life spa[illegible]
span, maximum life span, or life expectancy.

If you attempt to compare rats with humans, would you take humans in 1900, humans in 1954, humans in the United States or in Great Britain, or humans in India or China? With rats you might take my colony, Dr McCay's colony, or some other colony, and with all the different combinations you would get entirely [illegible]

[illegible] an attempt to [illegible] basis, I would [illegible] *role in limiting* our life span.

First, there are the diseases to which a particular species is susceptible. In humans we have a group of diseases that are prevalent such as atherosclerosis and tumours of various sorts. In rats we have another set of diseases. These are the predominant diseases found in our colony of rats. The rats are allowed to live until they reach a moribund state and then are killed. An autopsy is done by Dr Berg and the information is tabulated, and this represents the information from a large number of rats over a number of years:—

Renal Disease: Chronic nephrosis and chronic glomerulonephritis, often with hypertension and cardiac hypertrophy.

Tumours—

Epithelial: Chromophobe adenoma of the pituitary, fibroadenoma of the breast (female), adenoma and carcinoma of the thyroid, islet tumour of the pancreas.

Nerve Tissue: Pheochromocytoma of the adrenal.
Connective Tissue: Subcutaneous fibroma, subcutaneous and peritoneal myxoma, fibrosarcoma.

Periarteritis, involving chiefly the pancreatic, mesenteric, and spermatic vessels, as well as vessels in other organs.

Degenerative disease of the striated muscle.

Pulmonary Disease (in some colonies this is the main cause of death): Chronic bronchiectasis, bronchiectatic abscesses, chronic pneumonitis, acute diffuse necrotising pneumonitis.

In many rat colonies pulmonary disease predominates. In our rat colony we have reduced pulmonary infections to a low level. Finally, in the list there is myocardial fibrosis and left auricular thrombi.

All of these diseases have their counterparts in man, but none of these is identical with the predominant diseases in humans. Nevertheless, the mortality curves of rats and humans follow a similar pattern. One factor is that the diseases are typical of a particular species. Another factor is the intrinsic susceptibility to [illegible]

[illegible]

of using the equation, the log P_o represents using the intrinsic susceptibility to adult diseases in the infant individual. In other words, the intrinsic susceptibility to the diseases to which the species is susceptible is so [illegible]
enough to accour [illegible]
intrinsic susceptib [illegible]
times greater in rats than in man.

The third factor is the increase in death-rate from the various diseases or susceptibility to diseases, however it is expressed, with advancing age as represented by the slope of the curve. In humans the curve rises at a relatively moderate slope; in rats it rises very [illegible]

[illegible]

increase in the death-rate with advancing age. It will be noted that in the following equation for life expectancy (t) the value of k appears twice and the value of P_o appears once:—

$$t=\frac{1}{k}\log\left(\frac{1\cdot6k}{P_o}+1\right).$$

If in rats the slope of the curve is the same as in humans but the [illegible]

The three factors that I have mentioned are dependent upon three other factors relative to the accumulation of pathological lesions. To take any type of lesion, either rat or human, the probability that a lesion will occur is a factor that has to be taken into consideration. In rats, for all of the predominant diseases, the probability of occurrence is very much higher than in humans.

and that a smaller lesion can prove lethal may be contributing factors.

Thirdly, from our data on rats we have evidence that there is an "age factor" that accelerates the accumulation of lesions in older animals. In other words, the older animals acquire primary lesions more rapidly than can be accounted for by the chance frequency observed in younger animals. The nature of the age factor (or factors) is unknown.

Age hastens the frequency of appea... and the development of their lethal effects. Ageing involves a time factor that makes organs or tissues increasingly susceptible to disease.

The question is often asked, "What would happen if all known diseases were abolished?" Our answer is this: We might expect to die from diseases that have not yet appeared in a form that can be recognised as a clinical entity. These might be "physiological dysfunctions" in the sense that this term applies to the diabetes,

When any ...not sufficient to report that the animals live longer than the controls. It is important to report which causes of death are affected, and in what way. Many things that extend our life span have no relation to ageing, as, for example, smallpox vaccination.

To summarise, the life span of a species is determined by a number of factors involving the principal causes of death of that species, as well as the development of the lesions that contribute to death; but the most predominant factor is the greater frequency of appearance of pathological lesions with advancing age.

DISCUSSION

Professor ROGER DE GRAILLY (Bordeaux): "Do you consider extrinsic factors such as disease and intrinsic factors such as overwork, emotion, or factors of accidental nature such as trauma, cancer, and tuberculosis as distinctive factors in the process of ageing differentiated from normal ageing?"

Dr SIMMS: " In our rat colony we have attempted to eliminate extrinsic factors as far as possible. Our animal quarters are air-conditioned, temperature and humidity are controlled, and light is uniform throughout the whole year—twelve hours' light and twelve hours' darkness. The diet also is the same throughout the whole experiment; so that under these conditions the extrinsic factors are uniform."

Dr L. C. STRONG (New York): " I should like again to re-emphasise the genetic factor in longevity. These remarks stem from observations in a colony of mice bred under standard conditions and inbred and hybridised over a period of thirty-five years. Longevity responds to selection. The CBA strain has been selected for longevity by brother-sister matings for more than seventy-five generations. The mice now will live longer than any other mice in the same laboratory.

" Following hybridisation, the range of variability is greater in the F_3 than in the F_2, thus indicating the inheritance of multiple [illegible]

by the formation of the zygote."

HIRSCH, S., Brussels. *Senescence, entropy, and cybernetics: a clarification of basic concepts in gerontological research.*

ONE cannot over-emphasise the fact that the present interest in the ageing problem did not originate in any recent acquisitions of medicine or biology, but in the revolutionary reversal of the demographic ageing pyramid that occurred in many countries in the course of several generations. Surely, the progress of hygiene and medicine did contribute to this evolution by averting a number of mortality factors. Nevertheless, social influences—the vertiginous course of industrialisation, the rural exodus. the so-called [illegible] the hecatombs of two [illegible] populations.

[illegible] ageing research by surprise. So far, we do not even have a clear definition of what ageing is. Clarification is urgently needed, not only for theoretical reas[illegible] may compromise solu[illegible]

[illegible] f an exposition, whereas in the following, definition is the aim. We must start from the objects, methods, and acquisitions of ageing research. Ageing research covers three kinds of objects: (1) Physico-chemical systems; (2) living systems, plants and animals, protozoa and metazoa, cells and tissues; (3) the individual organism of man.

For physical-chemical systems ageing research uses analytical-deductive and experimental methods. They also are analytical for living systems, the object of biological investigations. By experiments, research tries to imitate, accelerate, or slow down supposed ageing phenomena.

For ageing research conc[illegible] analytical methods are also [illegible] as we have stated in previo[illegible] that the aspect of an organism's surface and complexion gives a surer estimation of the individual's age than the appearance of his interior organs and tissues. The criteria of age vanish more and more as dissection progresses inwards and into histological details. Therefore, in physio-pathological research of ageing, analytical methods of a morphological, physico-chemical, functional or psychological nature may be applied only with the addition of a synoptic procedure in relation to the organism as a whole.

Evidently, by disregarding the difference between the objects and methods, we get to a terminological confusion. This appears mostly through confrontation of the results of ageing research. We must claim to give more details. The "synoptic table" (p. 624) shows, in 3 (*a*) and (*b*), data in the three fields of ageing research. It shows also to what extent the data in the three fields is mutually separated or common.

We must underline that in the organism of man the so-called senile atrophy, the principal structural ageing phenomenon, is not a simple decrease but is a kind of metamorphosis, a replacement of certain specific tissue elements by less specific ones, such as connective and fat material. This metamorphosis does not occur simultaneously, but at different times in the regions, organs, and tissues. Also, in the functional domain ageing does not manifest itself by a mere decrease of the organism's somatic and psychic functions, but by modification of the relays which control and harmonise the functions. This applies to mechanical muscle actions, locomotion, body temperature and blood-pressure regulation, refraction in the eye, metabolic and psychic functions. Surely, getting old means weakening, losing reserves, becoming stiff, impotent, long-sighted, and even automatic. But, in return, it means being adapted to one's possibilities, firmness, personality. It gives sometimes that sort of sublime " presbyopia " which is the root of universality of views and judgment and is called the wisdom of the grand old men.

If such considerations show already the distance between the objects of ageing research in general biology and in biology of man, a real antagonism between these two gerontological branches becomes evident through the notion of illness. For a long time physicians accepted the old Roman sentence, "Senectus ipsa morbus," regarding senescence itself as a disease. It is worth noting that, contrary to the physio-pathological concept of to-day, many modern biologists unconsciously accept the same philosophy,

" WHAT IS AGEING ? "

(Synoptic Table)

A Clarification of Basic Concepts in Gerontological Research

AGEING RESEARCH.	PHYSICS AND CHEMISTRY.	GENERAL BIOLOGY.	PHYSIO-PATHOLOGY.
1 Objects .	Physico-chemical systems (I)	Living systems: Plants, animals, organs, tissues, cells (II)	Individual organism of man. (III)
2. Methods .	Analytical—Experimental		Analytical—Synoptic
3 Some data concerning ageing manifestations (a) *Structural*	Wear and tear of solid bodies, oxydation of metals. Coalescence in crystals and alloys Precipitation and condensation in fluids	Pigments deposition, especially in nervous [illegible]	
		Protoplasma vacuolisation in plant cells. Mitochondria *modifications*	Senile *metamorphosis* of organs: *replacement* of specific tissue elements by less specific ones. Heterochrony of structural ageing phenomena.
	In organic liquids, in vegetal and animal tissue extracts changes of colloid properties, dehydration, *modification* of surface tension. Change of content of calcium, cholesterol, etc.		
(b) *Dynamical*		Decrease of vitality phenomena: *chemotropism*, *phototropism*, metabolism. Decrease of growth and multiplication; changes of hormone and vitamin actions, established experimentally in protozoa and metazoa	Modification of the relays controlling somatic and psychic functions: *mechanic* muscle action, *locomotion*, body temperature, *blood-pressure regulation*, respiration rate, sense *functions*, *emotional* and *intellectual faculties* *
4. Relations between ageing and disease			*Basic difference* between pathological and ageing manifestations.
5 Ageing theories	Increase of entropy (cybernetics = information theory)	Vascular, nervous, hormonal, auto-intoxication, metabolic, connective tissue ageing theories.	
6. Definitions . " What is ageing ? "	*Degradation* of a closed system with time corresponding to the second law of thermodynamics, measured by the mathematical formula of entropy	*E* [illegible] Convergence, the pro- [illegible] with death	

* See S. Hirsch, " Das Altern und Sterben des Menschen " in " Handbuch der normalen und pathologischen Physiologie," vol. xvii (Springer, Berlin, 1926); " La durée de la vie et le vieillissement de l'homme," *Bruxelles-Médical*, 1949, 29, 577, 620

identifying ageing and perishing, and even consider ageing as a biological anomaly.

In our studies on the relation between ageing and disease we have shown, among other things, that it is a mistake to presume that the general resistance of an old organism is always less than that of a young one. Such a conception may be justified in micro-organisms like bacteria, but it is not so in man. During the last decade we have seen the physical and psychical suffering of vast groups of populations, whether they were inhabitants of bombed areas, prisoners in concentration camps, or refugees, and nobody claims that old people endured less than younger ones. Evidently the bad heart of an old man cannot stand much, but it is the heart disease, not senescence, which kills. In spite of the part still played by the diagnosis " senility " in mortality statistics of certain countries, the notion " physiological death " applied to man is, according to the most experienced pathologists (Aschoff, Roessle), more a *petitio principii* than a truth. Moreover, in spite of some biological conceptions, anatoma-pathological findings show that tissue regeneration faculty after an osseous lesion is not impeded, even with centenarians (A. L. Vischer and Roulet).

That makes enough examples to demonstrate the contradictions between physical, general biological, and physio-pathological concepts of ageing. I think we cannot escape from this dead end without renouncing an ageing definition of universal character, being content to give a precise delimitation of this term in the different fields of research. This proposal for delimitation may be astonishing at a time when mathematical curves and formulæ in biological papers seem to advertise a synthesis of biological and physical concepts, and when, on the other hand, some eminent physicists (N. Bohr, Schroedinger) approach the problem of life and man.

Nowadays, indeed, in physics the results of wave mechanics have produced a turning away from the causal-analytic theories. In physio-pathology such a turn became evident a long time earlier, at the end of the epoch of Darwin, Virchow, Pasteur, and Lister. It originates from certain insights in embryology, pathology, and endocrinology showing the role of autoregulation and correlations in the organism's constitution, evolution, and behaviour. Another basis of this trend came from experimental psychology; it concerned observations on the problem of pattern (" Gestalt ") or the perceptual formation of universals (Wertheimer and Köhler). These studies influenced our concept on the physiology of ageing, as we have underlined in our previous publications since 1926.

We must notice that the same influence is acknowledged in N. Wiener's " Cybernetics." This work on control and communication in the animal and the machine attempts a synthesis of concepts in most heterogeneous disciplines, such as physics, biology, psychology, and sociology. For the ageing research and its different

aspects, the "theory of information" seems to be all the more attractive, as the notion of "entropy," as the measure of a system's disorganisation, forms a starting point of Wiener's conception.

We are, of course, in no way competent to give a judgment about the significance of the information theory in mathematical and physic fields; but, in our opinion, the introduction of cybernetic symbols in biology, and particularly in ageing research, would merely increase the confusion of notions and definitions. Analogies always are potentially misleading.

The main cause of the chaos in the ageing research originates through exaggerated analogies, favoured by linguistic degeneration. It allows one to speak carelessly about life, or length of life, and consequently about the "ageing" of a car, a fountain pen, or a suit. In a metaphoric matter the scientists of the past century compared the organism with a machine; to-day, many will conceive the machine as an organism. Such analogies may be attractive for the vulgarisation of certain concepts, but they do not correspond to real facts. They cannot by any means bridge the gap between an organism, be it a micro-organism, and even the most refined machine. This gap is Life, which really does not exist outside the particular form of an organism.

In conclusion, we must establish that three answers exist to the question, "What is ageing?" (1) "Ageing" of physico-chemical systems has a simple meaning. It is the degradation of a closed system with time, corresponding to the second law of thermodynamics, measured by the mathematical formula of entropy. (2) On the contrary, "Ageing" of living systems—the objects of general biology—has a very broad signification. It means evolution as well as involution, progressive adaptation as well as irreversible failure of adaptation to environmental influences, progressive decadence terminating with death. (3) As far as the individual organism of man is concerned, "ageing" evidently can be understood neither by the laws of thermodynamics nor as the sum of cellular and tissue ageing phenomena. If analytical and experimental investigations give insights about some ageing mechanisms in living systems, it cannot cover the distance between the objects of general biological research and man's organism. The senescence of man is the progressive, irreversible, structural, and functional transformation along time of the organism as a whole. The senescence manifestations are basically d[illegible] ng, [illegible] ical n[illegible] gerontological work.

Whoever can delve a little into the enormous bibliography must conclude that perhaps no branch of biology is as much overgrown by misunderstandings as the research of ageing. Nowhere have so many data been displaced by fantastic interpretations

and [illegible] authors, [illegible] Ageing [illegible] We recall

[illegible]

sometimes forgets that in the practical medical field important progress must be noted concerning the ageing problem. For Charcot arthritis was a typical ageing disease. Yet recently cancer had been considered as an ageing disease. There is no better example for this evolution than the changes of the concepts concerning arteriosclerosis. For a long time this disease used to be considered as a phenomenon of normal senescence; then the clinicians regarded arteriosclerosis as the prototype of a disease of old age. Experimental research, mainly by Anitschkow, has shaken this view. To-day, the opinion more and more prevails that arteriosclerosis is not an unavoidable disease of old age but one of our technical civilisation. Thus, as we have underlined in our studies on the beginnings of arteriosclerosis, this disease has become a scourge for contemporary humanity, which prevents man from reaching a normal and advanced age.

The example shows clearly the importance of differentiating between ageing and pathological manifestations for practical individual and social questions. The erroneous interpretation of a malady's symptom as an ageing phenomenon paralyses medical activity, because ageing is the object of no therapy. On the other hand, the social measures for old people's protection require selection between healthy and ill persons, not only in homes and hospitals, but also for rehabilitation and occuption.

In conclusion we must once more underline the existence of two important antagonisms in ageing research: that between physico-chemical and general biological, and that between general biological and physio-pathological concepts. The gap between physico-chemical and general biological concepts can be bridged neither by thermodynamics nor by cybernetics. The fusion of [illegible]

[illegible]

explications.

COMFORT, A., London. *Absence of a parental age effect upon the longevity of the fruit fly "Drosophila subobscura."*

Lansing (1947) has shown that in rotifers bred from eggs laid by old individuals, the age of the parent exerts a cumulative effect on the longevity of the progeny. In *Philodina citrina* the life span declines rapidly in successive generations when the strain is maintained in each generation from eggs laid on or after the sixth day of parental life.

[illegible] *subc*[illegible] gene[illegible] imaginal life. No significant change in imaginal longevity was found.

The stock of flies upon which this experiment was carried out appears to have reached a stable condition, with a relatively short life span (mean, twenty-four to twenty-seven days). The offspring raised over eight generations from the eggs of old mothers, have an expectation of imaginal life which does not differ from that of the general stock, and the selection of long-lived parents in each generation does not increase the imaginal longevity of the progeny.

REFERENCE

Lansing, A. (1947). *J. Gerontol.*, 2, 228.

CLARKS, JEAN M., and SMITH, M. J., London. *Hybrid vigour and longevity in "Drosophila subobscura."*

The fruit fly *Drosophila subobscura* has been used to discuss the phenomena of hybrid vigour. Hybrid vigour is the possession of a number of characters which confer fitness in a wide range of environments and which are properties of the organism as a whole and not of some specific part of it. Some of the characters regarded [illegible] birth-rate, [illegible] rs [illegible] o [illegible] it [illegible] s. [illegible] es [illegible] be [illegible] der [illegible]

The features they have in common are, firstly, that they are very often extremely difficult to improve by selection. We have already had an example in the case of longevity. It is perhaps not very

surprising that this should be so, since natural selection has been attempting to improve these characters for many billions of years, and it has come to be very difficult to push it further.

The second feature of the inheritance of these characters is that they very often decline—and in *Drosophila* disastrously—as a result of inbreeding. To give an example in another field, I have found that the mean number of progeny per day per individual female in *Drosophila* falls from forty-eight to one in seven generations of brother and sister mating. That is why I say there can be a [illegible]

in the wild species.

The experiment we carried out started from two inbred lines of *Drosophila subobscura*, which I will call B and K. The K line was derived from fourteen generations of brother and sister mating of the stock Comfort originally used for his experiments. The B line was quite unrelated and came from a different country, but had also been brother and sister mated at the time of the experiment for fourteen generations.

We have used two types of hybrid: B/K with B mothers and K fathers, and K/B working the cross the other way. We took 200 flies, each of the four classes consisting of fifty males and fifty females. The flies were kept in mated pairs in a vial and were transferred to new fresh vials once every four days. Deaths were scored at the end of each four-day period.

Statistical demonstration is not necessary to show that hybrids lived longer than did the inbred lines. The increase in mean life span is about twofold, seventy instead of thirty-five days.

In the hybrids there is no very marked difference between the sexes. There are differences that happen to be in opposite directions from the two classes of hybrid, but the differences are much less great.

First, it would be wrong to assume that the hybrids live longer because they have in some way a lower rate of development. Their rate of development during the egg, larval, and pupæ stages is [illegible]

of *Drosophila*.

I do not s[illegible] necessarily live as long as this, but [illegible] which we subsequently [illegible]ditions as these flies. The trouble is that one does not know the age of the fly when caught. Of eleven such females last spring more than half

(six) lived for fifty days, and the oldest one died after seventy-three days. They must have been at least a week old when caught, judging from their appearance. Their life span is therefore more equivalent to that of the hybrids. What we have done by crossing, therefore, is to restore what happens in a wild outbred species without creating anything new. Nevertheless, the difference is striking. And it is well to bear in mind particularly the contrast between the rapid improvement produced by our crossing and the apparent absence of any improvement by selection. That is the main point I want to emphasise.

There is one last point about such life tables. It is useful in a *table of this sort to have some measure of the degree of senescence* shown by the population. A convenient measure, simple to work out, is the ratio between the time taken for 90 per cent. of the population to die over the time taken for 50 per cent. to die. If there were no increase in mortality with age—if at 70 your human being was as likely to survive for another year as your human being of 30—your result with the 90 : 50 ratio would be 3·3, where clearly if all the individuals of a population died on the same day, the ratio would be 1. If we attain a ratio 90 : 50, significantly less than 3·3 —and in that hybrid line it is 1·25, very low indeed—it shows that changes must be occurring in individual females, rendering them more susceptible to the various factors causing death as these individuals become older.

[illegible]

that in this hybrid graph we have a very sharp onset of senescence [illegible]

[illegible] n different. [illegible] d very *high* [illegible] re. That is certainly the case with F_1 between two relatively homozygotal flies. It has sometimes been thought that if a life table of *this* sort shows a sudden and sharp onset of senescence in the population, it necessarily says something about the way in which senescent processes are going on in the individual. Nevertheless, unfortunately it *does not; and the next job is to study the process* that goes on in individual females, because that cannot be *deduced* from the behaviour of a population of this sort.

FILMS

The following films were shown in the Hoare Memorial Hall during the Congress:—

1. E. W. Bobst.
   The Yarnell story.
2. Trevor Howell.
   Medical care of old people.
3. W. Hughes.
   Chronic cerebral hypertensive disease.
4. Ollie Randall.
   (*a*) *Such a busy day to-morrow.*
   (*b*) " *R* " *for happiness.*
5. Marjory W. Warren.
   The double amputee.

SECTION IV

Sessions were held on the undermentioned subjects:—

1. Changes in Cells with Ageing.
2. Mental Inefficiency in the Elderly.
3. Genetical Aspects of Ageing.

The following contributed to the discussion in one or more of the sessions:—

Professor A. von Albertini, Histopathological Laboratory, The University, Zurich.

Professor W. Andrew, Department of Anatomy, George Washington University, Washington, D.C.

Professor J. Aub, Massachusetts General Hospital, Boston.

Dr R. Barer, Department of Anatomy, The University, Oxford.

Dr L. G. Bell, Department of Zoology, King's College, London.

Dr F. Bourlière, Department of Medical Biology, The University, Paris 6.

Dr G. H. Bourne, Department of Histology, London Hospital School of Medicine.

Professor L. Brull, Department of Medicine, The University, Liège.

Professor W. S. Bullough, Department of Zoology, Birkbeck College, London.

Dr A. Comfort, Department of Zoology, University College, London.

Professor E. V. Cowdry, Washington University, St Louis, Mo.

Dr M. Critchley, National Hospital, Queen Square, London.

Professor J. F. Danielli, Department of Zoology, King's College, London.

Dr E. B. Ford, Genetical Laboratory, Department of Zoology, The University, Oxford.

Dr G. O. Gey, Johns Hopkins Medical School, Baltimore.

Dr A. Gillis, Geriatric Unit, General Hospital, Sunderland.

Dr A. Glucksmann, Strangeways Research Laboratory, The University, Cambridge.

Dr W. J. Griffiths, Department of Chemical Pathology, St Thomas's Hospital Medical School, London.

Professor L. van der Horst, The University Psychiatric and Neurological Clinic, Amsterdam.

Dr J. E. Kirk, Department of Gerontology, Washington University, St Louis, Mo.

Dr V. Korenchevsky, Gerontological Research Laboratory, Whittington Hospital, London.

Professor W. B. Kountz, Department of Gerontology, Washington University, St Louis, Mo.

Dr A. I. Lansing, Department of Anatomy, Washington University, St Louis, Mo.

Dr I. Lasnitzki, Strangeways Research Laboratory, The University, Cambridge.

Professor G. O. E. Lignac, Department of Pathology, The University, Leiden.
Dr R. J. Ludford, National Institute for Medical Research, London.
Professor C. McCay, Cornell University, Ithaca.
Dr D. McKay, Department of Physics, King's College, London.
Dr W. H. McMenemey, Department of Pathology, Maida Vale Hospital, London.
Professor K. Mather, Department of Genetics, The University, Birmingham.
Professor P. B. Medawar, Department of Zoology, University College, London.
Dr D. Michie, Department of Zoology, University College, London.
Dr O. Olbrich, Geriatric Unit, General Hospital, Sunderland.
Dr W. Ross Ashby.
Dr S. Sherwood, National Institute for Medical Research, London.
Dr N. Shock, Department of Gerontology, National Institute of Health, Baltimore.
Professor H. S. Simms, Department of Pathological Chemistry, Columbia University, New York.
Dr L. C. Strong, Roswell Park Institute, Biological Section, Springville, N.Y.
Dr N. M. Sulkin, Department of Anatomy, Winston-Salem, North Carolina.
Dr J. M. Tanner, Sherrington School of Physiology, St Thomas's Hospital, London
Professor F. Verzár, Institute of Physiology, The University, Basel.
Dr R. L. Warrall, Sevenoaks
Professor E. Witchi, Department of Zoology, State University, Iowa.
Dr E. Woodford-Williams, Geriatric Unit, General Hospital, Sunderland.

INDEX OF OTHER COMMUNICATIONS READ AT THE CONGRESS

1. ACKERMANN, P. G., BUEHLER, H. J., KHEIM, T., and KOUNTZ, W. B., Washington University, St Louis, Mo.

   The influence of nutritional and hormonal factors on the serum lipoproteins in elderly subjects: studies with the ultracentrifuge and zone electrophoresis.

2. ALLISON, R. S., Physician, Belfast.

   Focal cerebral lesions in later life and their differentiation from the presenile dementias.

3. BANHAM, KATHERINE M., Professor of Psychology, Duke University, Durham, North Carolina.

   A genetic theory of life span emotional changes.

4. BEDFORD, P. D., Geriatric Physician, Oxford.

   Irreversible decerebrate state following acute hæmorrhage in elderly people.

5. BERNADETTE DE LOURDES, MOTHER M., Superintendent, Mary Manning Walsh Home, New York, N.Y.

   The integration of residential care with the community.

6. BLUMENTHAL, H. T., and HANDLER, F. P., Department of Pathology, The Jewish Hospital, St Louis, Mo.

   Mechanical factors in the genesis of arteriosclerosis.

7. BOWEN, MISS GEORGENE E., Director of Education, Education-Recreation Division, Health and Welfare Council, Philadelphia, Pa.

   Social recreation's role in the life of the ageing.

8. BURSTEIN, MISS SONA R., Wellcome Historical Medical Museum, London.

   Old women and witchcraft: a chapter in the psycho-pathology of old age.

9. DANEMAN, E. A., CHORNESKY, G., and HAYCOX, J. A., Worcester State Hospital, Worcester, Mass.

   Psychosomatic investigations of cerebral arteriosclerosis with psychosis.

10. DAVIES, D. F., Department of Internal Medicine, Washington University, St Louis, Mo.

    (*a*) *Perspectives in gerontology.*
    (*b*) *The effects of therapy on primary amine formation in hypertension.*

11. DELORE, P., Professor, Faculty of Medicine, Lyons, and Technical Adviser, Ministry of Public Health.

    Sur la diabete des gens ages.

12. DIGBY, E., London.

    Reversionary factors in age decay.

13. EDER, H. A., RUSS, ELLA M., and BARR, D. P., Cornell University Medical College, New York City.
    The effect of hormones on the composition and distribution of lipoproteins in human plasma.

14. EDWARDS, J. C., BURNSIDES, J., SWARM, R. L., and LANSING, A. I., Washington University, St Louis, Mo.
    The incidence of arteriosclerosis in the intramural as compared to extramural coronary arteries.

15. ENGEL, S., Department of Anatomy, University of Birmingham.
    Ageing of the mammary gland.

16. ENGELBERG, H., Physician, Los Angeles, California.
    Studies of plasma heparin levels in relation to sex, age, and serum lipids and lipoproteins.

17. FRASCHINI, A., Physician, Milan.
    Interdependence between senescence and decrease in gonadic function: a biological method of re-invigoration.

18. FLEETWOOD, J. F., and HOLLAND, P. D., Dublin.
    Hæmatological findings in the later age groups.

19. FLEMING, C., Lecturer, Department of Social and Industrial Medicine, University of Sheffield.
    Gerontology as an applied science.

20. FORSSTRAND, MRS ESTHER C., Consultant, Division for the Aged, Health and Welfare Council Inc., Philadelphia, Pa.
    How one community is adapting its resources to an ageing population.

21. FREEMAN, H., ELMADJIAN, F., PINCUS, G., ROMANOFF, L. P., Worcester State Hospital, Worcester, Mass.
    Adrenal responsibility in aged psychotic patients

22. FREEMAN, J. T., Physician, Philadelphia, Pa.
    Paget's disease.

23. FREMONT, R. E., Physician, Brooklyn V.A. Hospital, Brooklyn, N.Y.
    An analysis of the clinical response and tolerance of the elderly cardiac to various digitalis glycosides as compared with the average adult.

24. GEILL, T., Chief Physician, De Gamles By, Copenhagen.
    Studies on blood coagulation in old age.

25. GEORGE, A. K., University of Cincinnati.
    The teaching of the medico-social aspects of gerontology in medical education.

26. GILDEA, MARGARET C. L., and GILDEA, E. F., Department of Neuropsychiatry, Washington University, St Louis, Mo.
    Management of ageing mental patients on a fifty-four-bed private psychiatric service in a general hospital.

27. GOLDFARB, A. I., New York.
Psychodynamics of the therapeutic situation with aged patients.

28. HANSEN, F., Kobenhavns Amtssygehus i Gentofte, Hellerup, Denmark.
The mortality of coronary thrombosis and cerebral hæmorrhage month by month in different countries.

29. HERBEUVAL, R., CUNY, G., and MANCIAUX, M., Department of Geriatrics, Nancy, France.
The study of electrolytes K and Na and of osmotic pressure of the plasma by cryoscopy in 200 aged subjects.

30. HOWELL, T. H., Physician, London.
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31. HUET, J. A., School of Anthropology, Paris, and STREM, N., Paris.
Level of polypeptides in serum of aged.

32. INGRAM, Miss V. M., Director of Educational Therapy, Bronx, N.Y.
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33. KAUFMAN, W., Bridgeport, Conn.
The use of vitamin therapy to reverse certain concomitants of ageing.

34. KIRK, J. E., and LARSEN, T. S., Department of Gerontology, Washington University, St Louis, Mo.
Diffusion coefficients of some gaseous and non-gaseous solutes in human aortic tissue from individuals of various ages.

35. KOUNTZ, W. B., Washington University, St Louis, Mo.
The influence of certain endocrine gland substances on the physical state and nutrition of older individuals.

36. KOUNTZ, W. B., ACKERMAN, P. G., and KHEIM, T., Washington University, St Louis, Mo.
The influence of sex hormones on nutrition as revealed by changes in the serum protein fractions in induced menstruation in elderly subjects.

37. KOUROCH, P. DE, Physician, Paris.
The incidence and clinical manifestations of mycotic infections.

38. LEVINE, H., New York. (Paper read by Frances King.)
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39. LITWINSKI, L., Brussels, Belgium.
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40. MARX, W., WEISS, S. B., and HENKIN, G., Los Angeles.
Cholesterol balance in mice as influenced by thyroid and by dietary condition.

41. McCARTNEY, J. L., Physician/Neuropsychiatrist, New York.
The use of shock treatment in the involutional and senile psychoses.

42. McQUEEN, I. G., Medical Officer of Health, Aberdeen.
Medico-social care of the elderly in the United Kingdom.

43. MENSHI, I., Department of Neuropsychiatry, Washington University, St Louis, Mo.
Psychological functioning in the aged

44. MONAT, H. A., Washington.
Nutritional problems in cardiac disorders of the aged

45. MORPURGO, M., MARS, G., BONESSA, C, and BOSSELLI, A, Medical Institute of Biology, University of Milan.
The protein-mineral metabolism and the adrenocortical function in senile bone diseases.

46. NIEMI, T., Physician, Helsinki.
The Master's two-step exercise test in a series of 104 "healthy" old individuals.

47. PENDE, N., Rome
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48. PERLMAN, R. M., and DORINSON, S. M., Physicians, San Francisco.
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49. PLIMPTON, C. H, VALENZUELA, F., and PAYSON, H., Columbia Presbyterian Medical Centre, New York City
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50. RAAB, W., University of Vermont.
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51 RAGAINI, S, and MARS, G, Milan.
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(*b*) *On the terminal hæmoptysis in lung tuberculosis in advanced age (pathological findings).*

52 REES, W. L., Psychiatrist, Cardiff.
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53. ROB, C. G., Professor of Surgery, University of London.
Blood-vessel grafting in senile arteriosclerosis.

54. ROEN, P. B., Los Angeles.
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55. ROSENTHAL, T. B., and LANSING, A. I., Department of Anatomy, Washington University.
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